

**PRELIMINARY DATA**



# Fish Passage Study Data Request

## Physical, Hydrologic & Engineering Information (Items P3 – P5)

Prepared by  **MWH**

March 2013



## Assumptions from HEC ResSim Operations Model

- The information provided in the following slides assumes that the load fluctuation of the entire Railbelt would be provided by the Susitna-Watana Project, and that all other sources of electrical power in the Railbelt would be running at base load.
- This maximum load following case was developed for the purposes of assessing downstream stage changes and does not represent a realistic long-term hourly operation. Additional load cases are expected to be developed.
- The reservoir operations model is in the process of being refined to reduce or eliminate the frequency of the reservoir reaching the minimum power pool level while still maintaining power benefits.
- In conjunction with the Probable Maximum Flood study and other considerations, it is expected that future flood operations modeling will change the results for the highest flow periods.

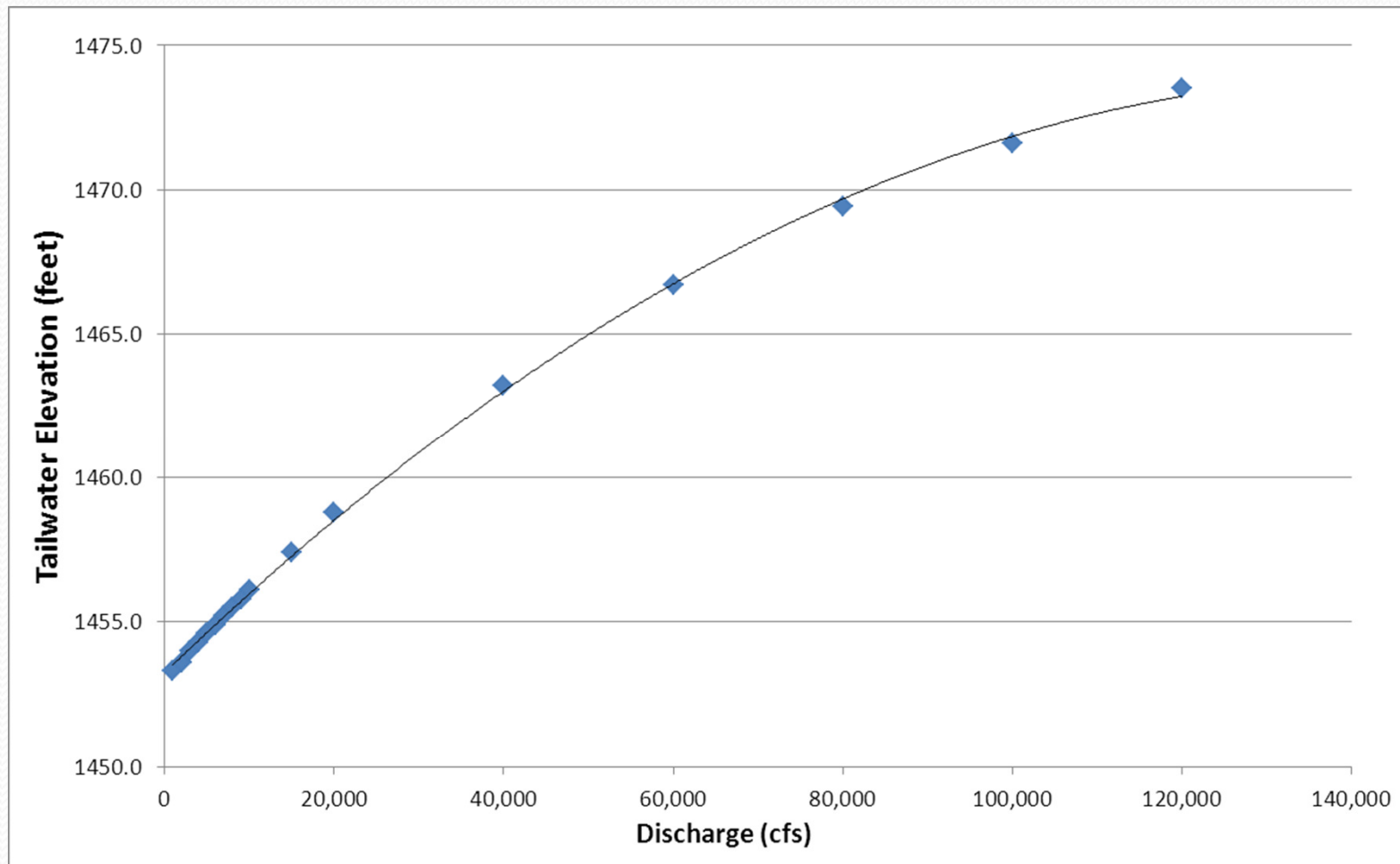
## P3 – Tailwater Rating Curve

<u>Discharge</u> (cfs)	<u>Tailwater Elevation</u> (feet)
1,000	1453.3
2,000	1453.6
3,000	1454.0
4,000	1454.3
5,000	1454.6
6,000	1454.9
7,000	1455.2
8,000	1455.5
9,000	1455.8
10,000	1456.1
15,000	1457.4
20,000	1458.8
40,000	1463.2
60,000	1466.7
80,000	1469.4
100,000	1471.6
120,000	1473.5

**Note:**

The tailwater rating curve used for operations modeling is a preliminary estimate and was based on Figure B.4.2.3 from the 1985 FERC License App., Vol. 2, Exhibit B.

# P3 – Tailwater Rating Curve Chart



# P4 - Monthly Flow Durations – Turbines (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	14,499	14,499	13,507	11,189	10,526	14,499	14,499	14,499	14,499	14,499	12,940	14,499	14,499
1%	12,954	14,025	10,493	9,729	9,595	9,161	14,499	14,499	14,499	12,602	10,707	12,648	14,499
2%	12,384	13,270	10,153	9,477	9,138	8,805	14,499	14,499	14,499	11,160	10,281	12,138	14,499
3%	11,984	12,942	9,955	9,338	8,938	8,548	14,499	14,499	14,499	10,413	10,118	11,807	14,499
4%	11,749	12,723	9,816	9,244	8,814	8,357	14,499	14,499	14,499	9,970	9,997	11,579	14,499
5%	11,596	12,536	9,707	9,159	8,730	8,204	14,499	14,499	14,499	9,694	9,903	11,408	14,499
6%	11,472	12,419	9,612	9,096	8,656	8,089	14,499	14,499	14,499	9,421	9,817	11,281	13,663
7%	11,376	12,324	9,530	9,042	8,597	7,979	14,499	14,499	14,499	9,226	9,753	11,179	12,717
8%	11,285	12,246	9,459	8,983	8,537	7,898	14,499	14,499	14,499	9,130	9,686	11,071	12,169
9%	11,207	12,165	9,396	8,929	8,479	7,826	10,030	14,499	14,499	9,016	9,614	10,993	11,727
10%	11,138	12,084	9,345	8,881	8,424	7,765	8,576	14,499	14,499	8,938	9,546	10,929	11,428
11%	11,073	11,994	9,294	8,839	8,373	7,709	8,290	14,499	14,499	8,835	9,496	10,864	11,151
12%	11,007	11,908	9,252	8,795	8,324	7,663	8,082	14,499	14,499	8,746	9,447	10,795	10,926
13%	10,945	11,809	9,209	8,751	8,272	7,616	7,929	14,499	14,499	8,652	9,385	10,732	10,726
14%	10,884	11,725	9,170	8,709	8,217	7,570	7,811	14,499	14,499	8,581	9,322	10,673	10,567
15%	10,825	11,644	9,131	8,671	8,164	7,526	7,705	14,499	14,499	8,520	9,259	10,618	10,427
16%	10,762	11,570	9,093	8,631	8,111	7,484	7,616	14,499	14,499	8,462	9,200	10,565	10,284
17%	10,703	11,500	9,057	8,596	8,058	7,445	7,536	14,499	14,464	8,410	9,155	10,511	10,155
18%	10,648	11,430	9,021	8,558	8,008	7,405	7,465	14,499	14,217	8,361	9,118	10,463	10,032
19%	10,594	11,353	8,988	8,524	7,952	7,364	7,403	14,499	13,955	8,317	9,077	10,408	9,917
20%	10,544	11,283	8,955	8,486	7,896	7,326	7,348	14,499	13,676	8,280	9,032	10,357	9,797
21%	10,499	11,211	8,921	8,456	7,835	7,286	7,300	14,499	13,451	8,238	8,985	10,305	9,684
22%	10,455	11,143	8,889	8,422	7,780	7,244	7,252	14,499	13,199	8,197	8,942	10,251	9,575
23%	10,412	11,078	8,855	8,387	7,721	7,202	7,211	14,499	13,063	8,159	8,903	10,201	9,472
24%	10,367	11,014	8,822	8,351	7,661	7,157	7,167	14,499	12,698	8,112	8,868	10,157	9,359
25%	10,323	10,952	8,792	8,316	7,594	7,111	7,126	14,499	12,506	8,055	8,832	10,117	9,250
26%	10,281	10,896	8,762	8,283	7,525	7,059	7,085	14,499	12,313	8,014	8,796	10,074	9,154
27%	10,240	10,841	8,733	8,250	7,453	7,010	7,047	14,499	12,098	7,974	8,763	10,034	9,069
28%	10,204	10,791	8,702	8,216	7,388	6,956	7,011	14,499	11,896	7,940	8,734	9,992	8,986
29%	10,168	10,744	8,673	8,176	7,325	6,906	6,974	14,499	11,670	7,894	8,705	9,949	8,907
30%	10,130	10,699	8,645	8,138	7,267	6,848	6,938	14,499	11,549	7,855	8,677	9,906	8,837
31%	10,092	10,659	8,615	8,103	7,206	6,796	6,899	14,499	11,492	7,820	8,649	9,857	8,767
32%	10,055	10,620	8,582	8,068	7,146	6,742	6,861	14,499	11,320	7,776	8,622	9,802	8,701
33%	10,021	10,583	8,550	8,033	7,092	6,687	6,820	14,499	11,187	7,743	8,596	9,749	8,637

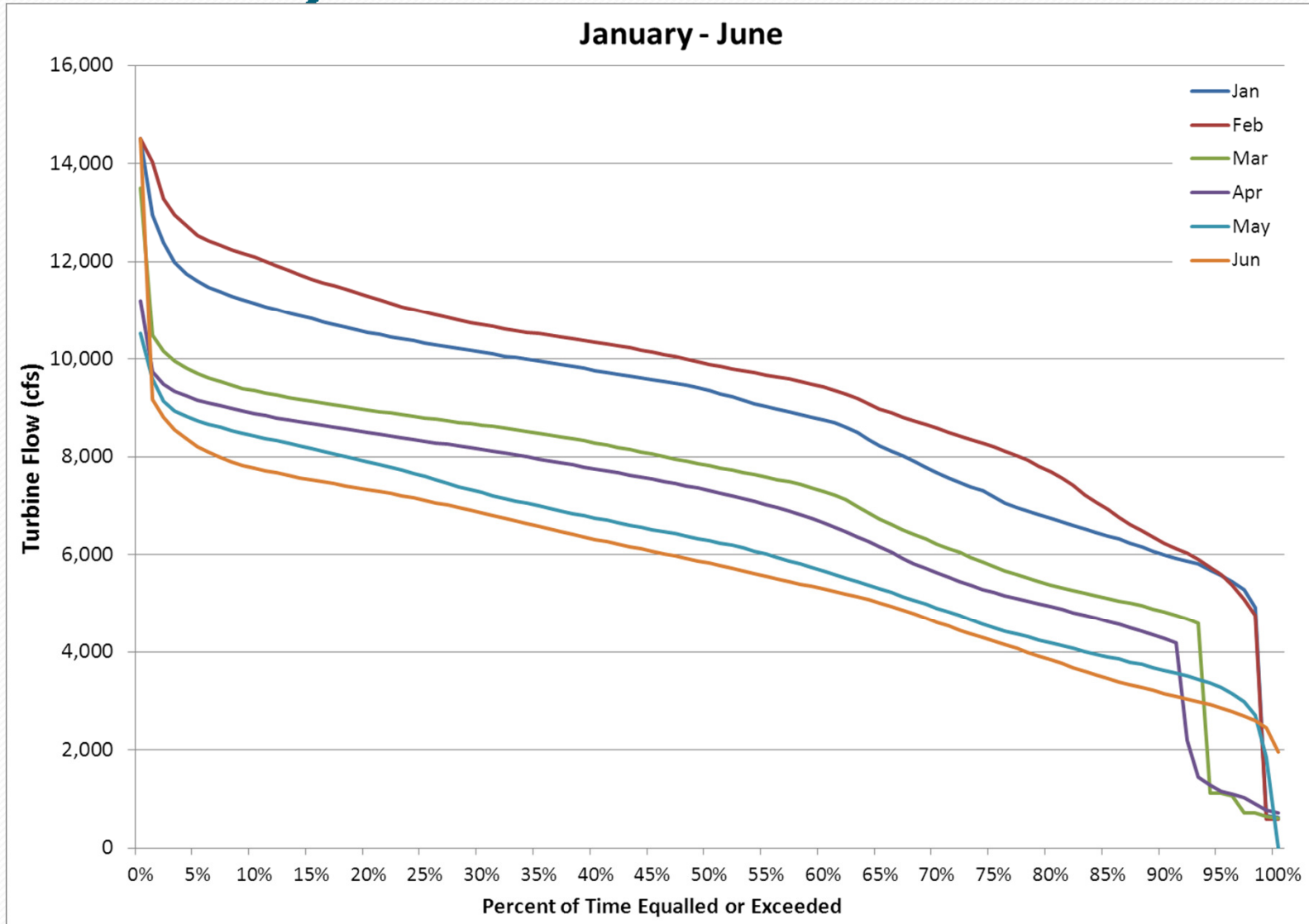
# P4 - Monthly Flow Durations – Turbines (2 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	9,986	10,548	8,517	7,994	7,045	6,633	6,780	14,499	11,001	7,714	8,568	9,693	8,574
35%	9,952	10,515	8,484	7,951	6,991	6,579	6,740	14,499	10,775	7,686	8,541	9,633	8,505
36%	9,916	10,481	8,446	7,908	6,941	6,526	6,695	14,499	10,666	7,657	8,510	9,577	8,433
37%	9,883	10,445	8,406	7,868	6,891	6,467	6,652	14,257	10,482	7,623	8,474	9,520	8,363
38%	9,843	10,412	8,366	7,831	6,839	6,410	6,607	14,044	10,358	7,586	8,435	9,461	8,292
39%	9,803	10,375	8,324	7,785	6,788	6,361	6,564	13,831	10,216	7,550	8,400	9,405	8,223
40%	9,762	10,339	8,278	7,746	6,743	6,310	6,524	13,673	10,050	7,524	8,362	9,346	8,153
41%	9,720	10,302	8,235	7,703	6,697	6,261	6,478	13,372	9,941	7,498	8,322	9,289	8,081
42%	9,681	10,264	8,190	7,663	6,650	6,212	6,432	13,161	9,789	7,465	8,282	9,234	8,014
43%	9,644	10,222	8,147	7,626	6,602	6,164	6,387	12,942	9,604	7,439	8,239	9,178	7,944
44%	9,609	10,179	8,097	7,582	6,556	6,113	6,341	12,645	9,502	7,414	8,188	9,127	7,871
45%	9,575	10,136	8,049	7,539	6,511	6,062	6,295	12,347	9,353	7,385	8,144	9,076	7,804
46%	9,541	10,089	7,999	7,496	6,467	6,015	6,248	12,134	9,200	7,357	8,108	9,030	7,737
47%	9,505	10,039	7,951	7,451	6,425	5,969	6,202	11,881	9,089	7,329	8,070	8,982	7,673
48%	9,464	9,989	7,902	7,403	6,377	5,918	6,149	11,545	9,019	7,289	8,023	8,936	7,610
49%	9,416	9,935	7,858	7,354	6,329	5,868	6,098	10,917	8,860	7,255	7,971	8,894	7,547
50%	9,353	9,889	7,810	7,305	6,283	5,822	6,050	10,381	8,716	7,227	7,906	8,854	7,488
51%	9,288	9,842	7,764	7,253	6,237	5,772	6,001	9,647	8,591	7,191	7,852	8,813	7,428
52%	9,222	9,796	7,719	7,198	6,188	5,723	5,951	8,662	8,435	7,160	7,810	8,769	7,368
53%	9,157	9,752	7,674	7,145	6,129	5,669	5,903	8,185	8,314	7,124	7,766	8,730	7,309
54%	9,087	9,710	7,627	7,084	6,071	5,616	5,858	7,943	8,194	7,084	7,714	8,689	7,245
55%	9,026	9,670	7,581	7,019	6,001	5,561	5,812	7,770	8,058	7,036	7,665	8,646	7,182
56%	8,969	9,628	7,534	6,953	5,937	5,505	5,762	7,613	7,966	7,003	7,621	8,596	7,119
57%	8,915	9,582	7,484	6,883	5,871	5,449	5,717	7,477	7,861	6,967	7,574	8,535	7,053
58%	8,863	9,534	7,426	6,809	5,808	5,397	5,672	7,380	7,752	6,935	7,529	8,465	6,987
59%	8,810	9,476	7,364	6,735	5,739	5,344	5,632	7,301	7,652	6,892	7,482	8,368	6,926
60%	8,753	9,417	7,296	6,656	5,669	5,294	5,590	7,219	7,555	6,851	7,430	8,256	6,860
61%	8,687	9,351	7,216	6,567	5,594	5,244	5,548	7,140	7,459	6,808	7,380	8,156	6,792
62%	8,606	9,273	7,118	6,472	5,524	5,188	5,500	7,070	7,378	6,759	7,311	8,075	6,722
63%	8,487	9,179	6,986	6,365	5,451	5,129	5,448	7,004	7,321	6,696	7,221	7,982	6,648
64%	8,346	9,075	6,843	6,265	5,375	5,071	5,393	6,931	7,264	6,621	7,105	7,890	6,579
65%	8,214	8,977	6,723	6,159	5,298	5,010	5,330	6,850	7,210	6,561	6,900	7,786	6,508
66%	8,107	8,889	6,610	6,045	5,216	4,938	5,262	6,768	7,158	6,491	6,756	7,655	6,434

# P4 - Monthly Flow Duration - Turbines (3 of 3)

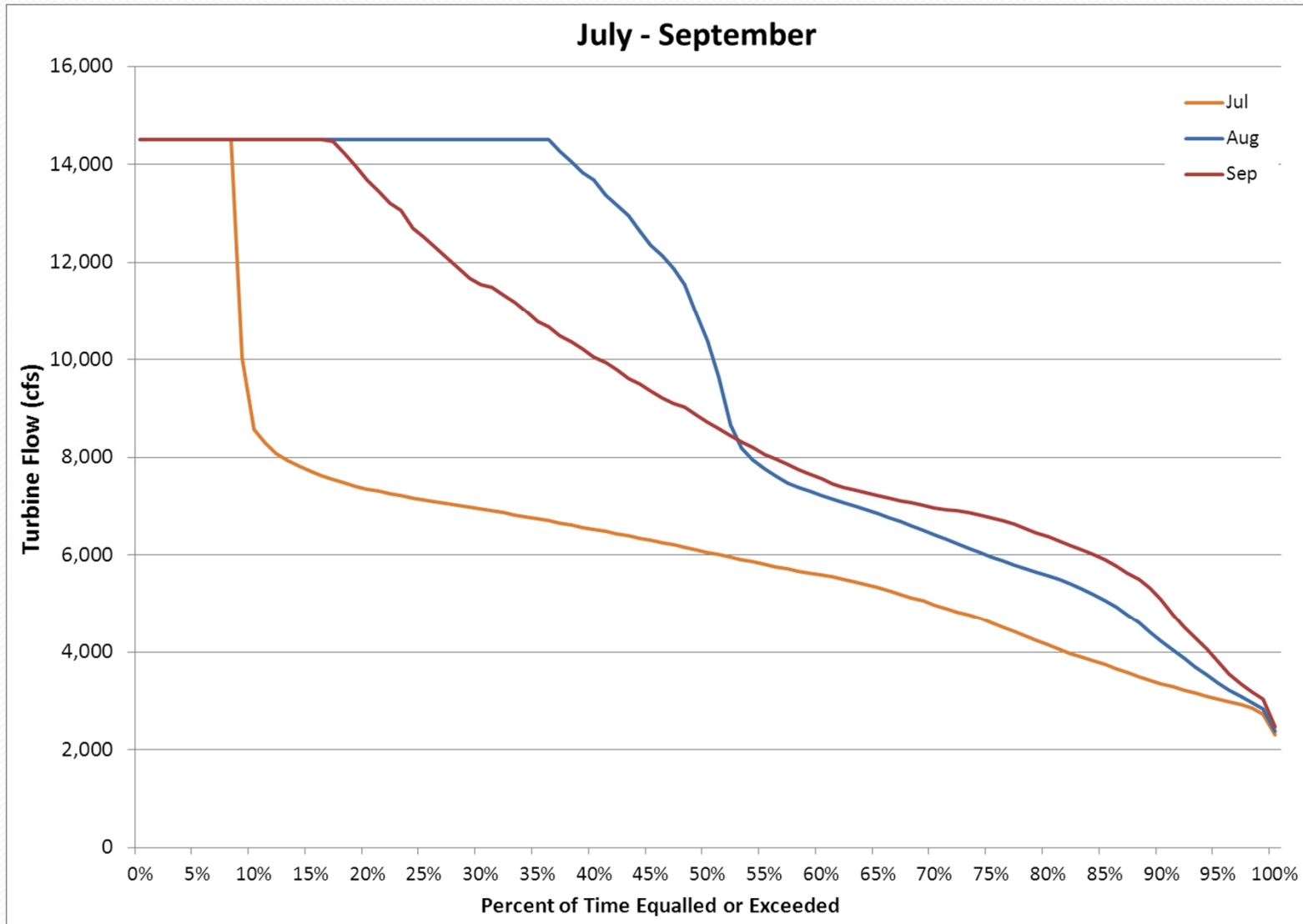
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	8,013	8,804	6,504	5,920	5,141	4,866	5,197	6,679	7,115	6,435	6,645	7,552	6,361
68%	7,910	8,729	6,409	5,807	5,062	4,778	5,124	6,593	7,068	6,349	6,566	7,471	6,290
69%	7,790	8,656	6,315	5,717	4,984	4,699	5,052	6,506	7,017	6,300	6,467	7,369	6,216
70%	7,665	8,583	6,215	5,625	4,903	4,611	4,977	6,416	6,968	6,241	6,383	7,279	6,140
71%	7,555	8,502	6,128	5,535	4,828	4,526	4,901	6,327	6,930	6,171	6,314	7,184	6,065
72%	7,469	8,428	6,044	5,451	4,746	4,440	4,830	6,229	6,899	6,111	6,201	7,100	5,983
73%	7,386	8,351	5,934	5,366	4,660	4,361	4,760	6,139	6,865	6,054	6,090	7,013	5,909
74%	7,302	8,271	5,841	5,287	4,576	4,290	4,686	6,048	6,821	5,969	5,931	6,903	5,834
75%	7,171	8,194	5,755	5,217	4,492	4,216	4,595	5,960	6,768	5,858	5,817	6,781	5,755
76%	7,047	8,107	5,668	5,154	4,429	4,140	4,506	5,877	6,700	5,746	5,730	6,677	5,674
77%	6,954	8,019	5,581	5,096	4,362	4,067	4,413	5,799	6,624	5,626	5,651	6,609	5,594
78%	6,880	7,924	5,508	5,042	4,304	3,991	4,323	5,722	6,535	5,462	5,586	6,527	5,509
79%	6,814	7,804	5,438	4,986	4,240	3,914	4,237	5,650	6,455	5,321	5,503	6,440	5,424
80%	6,743	7,683	5,373	4,925	4,184	3,840	4,144	5,567	6,367	5,216	5,418	6,335	5,336
81%	6,668	7,571	5,312	4,870	4,126	3,757	4,049	5,491	6,288	5,117	5,363	6,240	5,246
82%	6,600	7,421	5,255	4,808	4,073	3,671	3,970	5,405	6,185	5,063	5,305	6,166	5,158
83%	6,526	7,218	5,202	4,751	4,010	3,593	3,896	5,298	6,099	4,992	5,250	6,081	5,077
84%	6,454	7,071	5,149	4,688	3,953	3,519	3,818	5,185	6,001	4,939	5,193	6,002	4,996
85%	6,381	6,925	5,100	4,631	3,900	3,447	3,741	5,064	5,898	4,861	5,140	5,945	4,909
86%	6,312	6,761	5,051	4,571	3,848	3,381	3,657	4,924	5,765	4,785	5,097	5,903	4,817
87%	6,238	6,617	5,003	4,502	3,791	3,326	3,573	4,764	5,634	4,686	5,059	5,860	4,717
88%	6,151	6,483	4,943	4,430	3,740	3,267	3,488	4,597	5,496	4,590	5,023	5,802	4,600
89%	6,057	6,366	4,881	4,355	3,675	3,209	3,412	4,405	5,325	4,516	4,989	5,731	4,473
90%	5,987	6,231	4,816	4,272	3,620	3,143	3,342	4,228	5,086	4,415	4,950	5,640	4,338
91%	5,926	6,118	4,754	4,183	3,570	3,087	3,281	4,045	4,767	4,356	4,909	5,566	4,190
92%	5,871	6,025	4,681	2,202	3,505	3,031	3,221	3,880	4,508	4,242	4,869	5,481	4,026
93%	5,804	5,903	4,591	1,440	3,431	2,977	3,160	3,696	4,286	4,190	4,826	5,393	3,851
94%	5,689	5,742	1,118	1,279	3,357	2,920	3,097	3,523	4,052	4,113	4,788	5,292	3,646
95%	5,576	5,584	1,118	1,152	3,270	2,857	3,038	3,355	3,801	4,052	4,733	5,161	3,436
96%	5,443	5,362	1,066	1,105	3,147	2,781	2,985	3,222	3,549	3,976	4,674	5,044	3,229
97%	5,274	5,080	717	1,031	2,977	2,695	2,930	3,093	3,337	3,907	4,600	4,905	3,011
98%	4,918	4,743	717	902	2,698	2,596	2,855	2,966	3,188	3,794	4,522	4,666	2,714
99%	656	588	643	776	1,844	2,440	2,729	2,824	3,030	3,634	4,431	4,386	1,118
100%	618	588	603	714	0	1,950	2,309	2,370	2,475	3,422	4,235	3,997	0

# P4 – Monthly Flow Duration Curves – Turbines

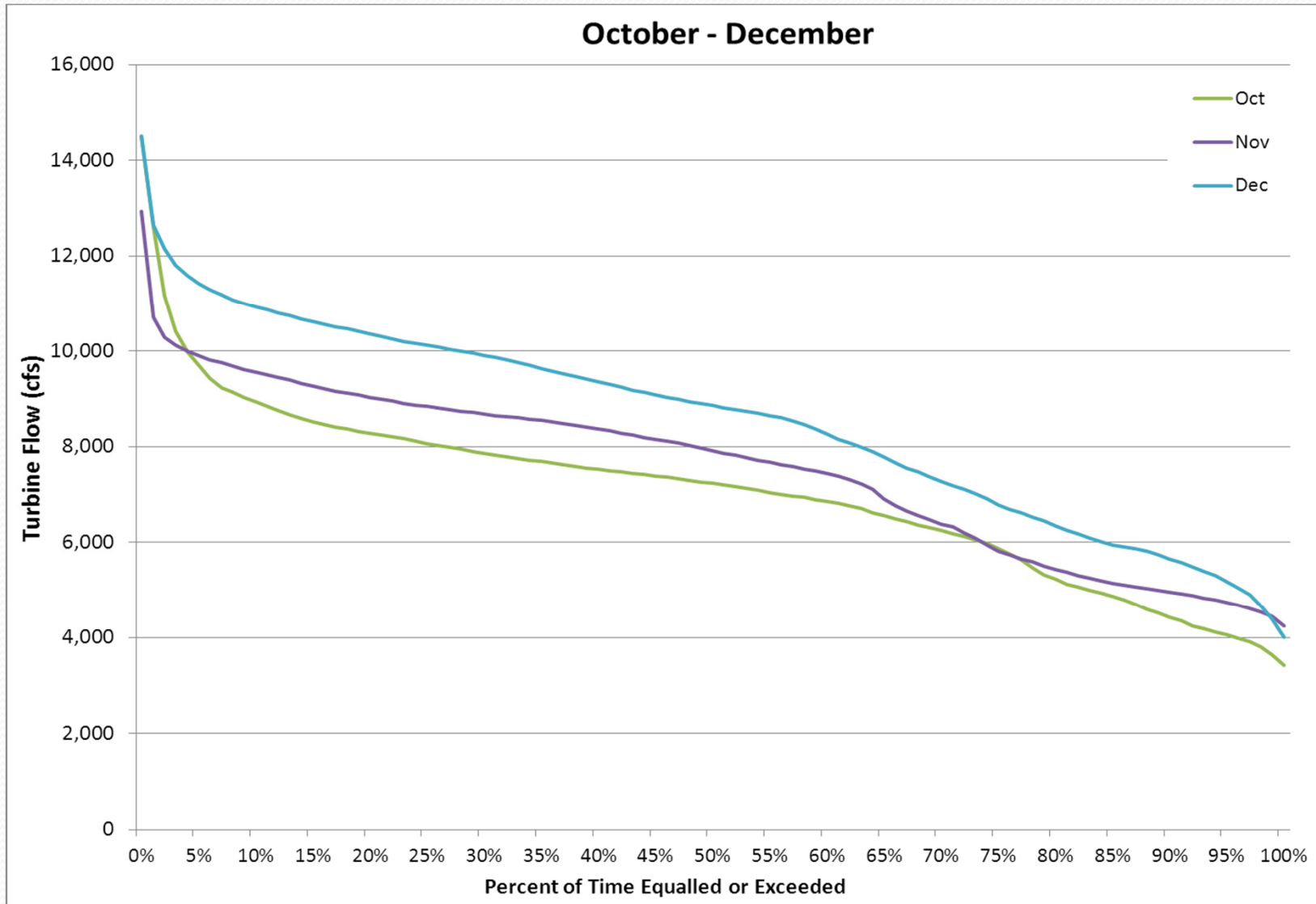




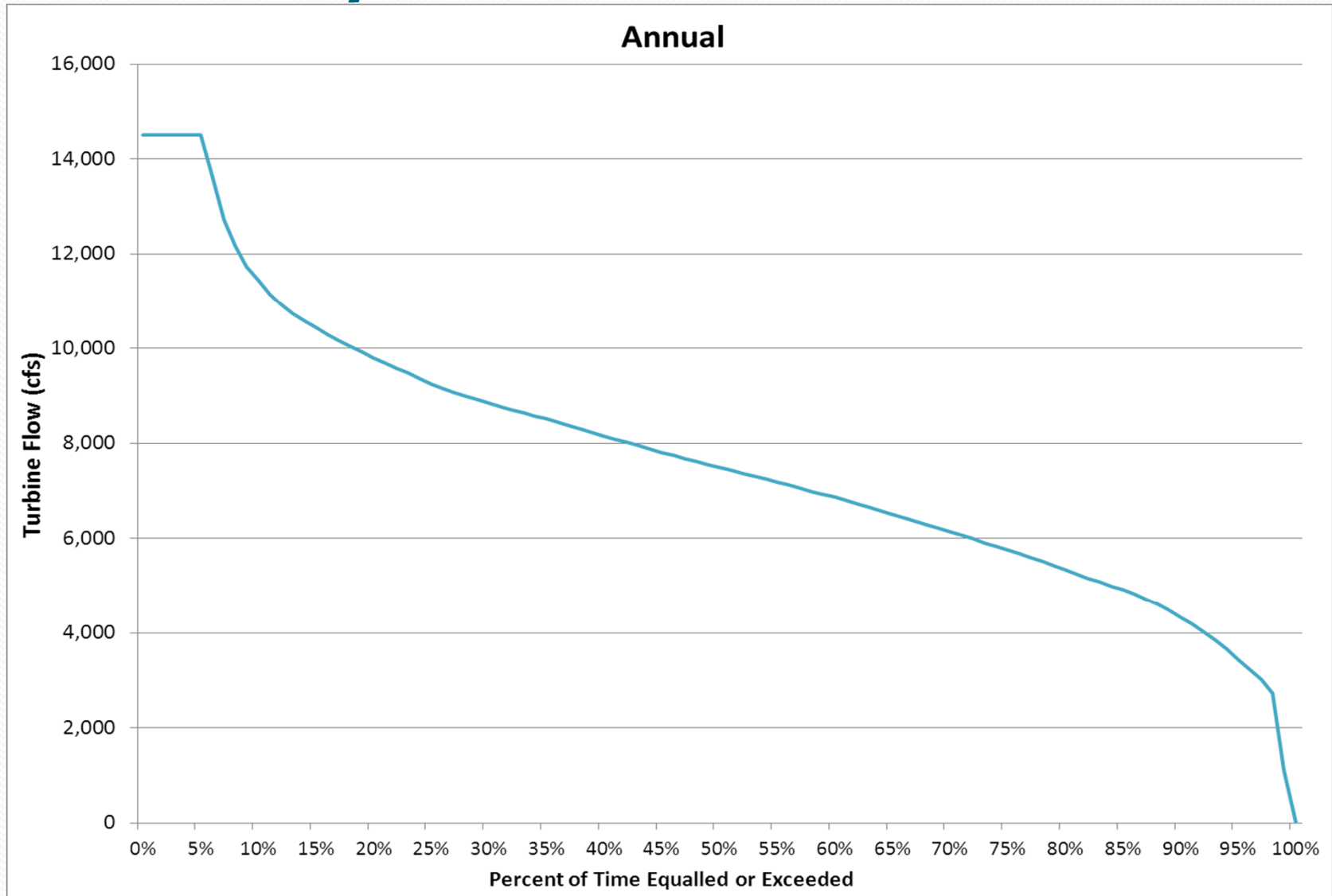
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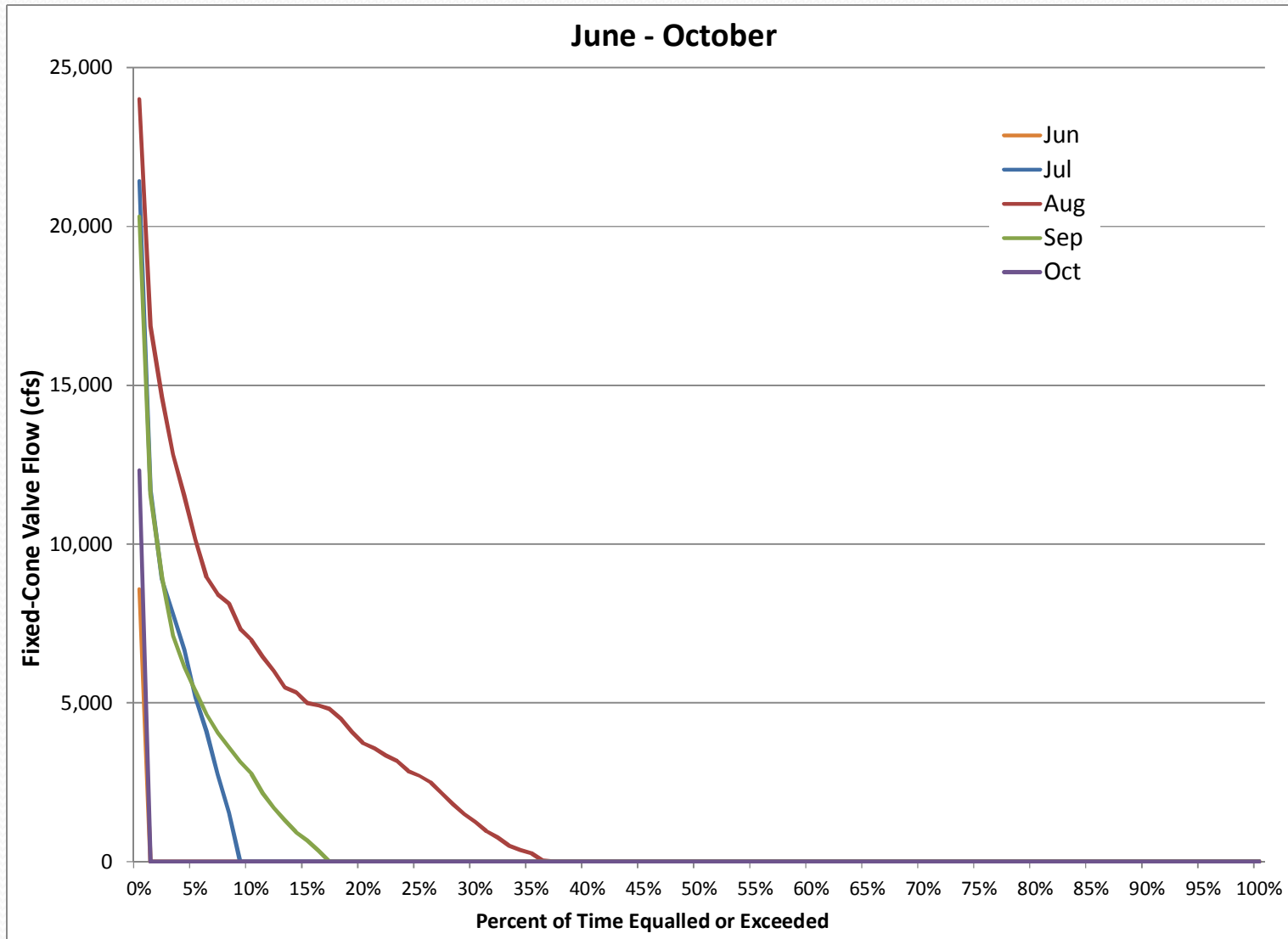
# P4 - Monthly Flow Duration – Fixed-Cone Valves

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	0	0	0	0	0	8,568	21,429	24,000	20,308	12,313	0	0	24,000
1%	0	0	0	0	0	0	11,709	16,858	11,565	0	0	0	8,415
2%	0	0	0	0	0	0	8,916	14,633	8,967	0	0	0	5,328
3%	0	0	0	0	0	0	7,809	12,824	7,121	0	0	0	3,567
4%	0	0	0	0	0	0	6,666	11,528	6,124	0	0	0	1,856
5%	0	0	0	0	0	0	5,179	10,148	5,379	0	0	0	323
6%	0	0	0	0	0	0	4,109	8,963	4,649	0	0	0	0
7%	0	0	0	0	0	0	2,762	8,415	4,059	0	0	0	0
8%	0	0	0	0	0	0	1,540	8,130	3,611	0	0	0	0
9%	0	0	0	0	0	0	0	7,335	3,148	0	0	0	0
10%	0	0	0	0	0	0	0	6,984	2,774	0	0	0	0
11%	0	0	0	0	0	0	0	6,449	2,156	0	0	0	0
12%	0	0	0	0	0	0	0	6,006	1,702	0	0	0	0
13%	0	0	0	0	0	0	0	5,486	1,312	0	0	0	0
14%	0	0	0	0	0	0	0	5,328	932	0	0	0	0
15%	0	0	0	0	0	0	0	4,997	672	0	0	0	0
16%	0	0	0	0	0	0	0	4,922	342	0	0	0	0
17%	0	0	0	0	0	0	0	4,810	0	0	0	0	0
18%	0	0	0	0	0	0	0	4,495	0	0	0	0	0
19%	0	0	0	0	0	0	0	4,089	0	0	0	0	0
20%	0	0	0	0	0	0	0	3,730	0	0	0	0	0
21%	0	0	0	0	0	0	0	3,567	0	0	0	0	0
22%	0	0	0	0	0	0	0	3,345	0	0	0	0	0
23%	0	0	0	0	0	0	0	3,175	0	0	0	0	0
24%	0	0	0	0	0	0	0	2,853	0	0	0	0	0
25%	0	0	0	0	0	0	0	2,703	0	0	0	0	0

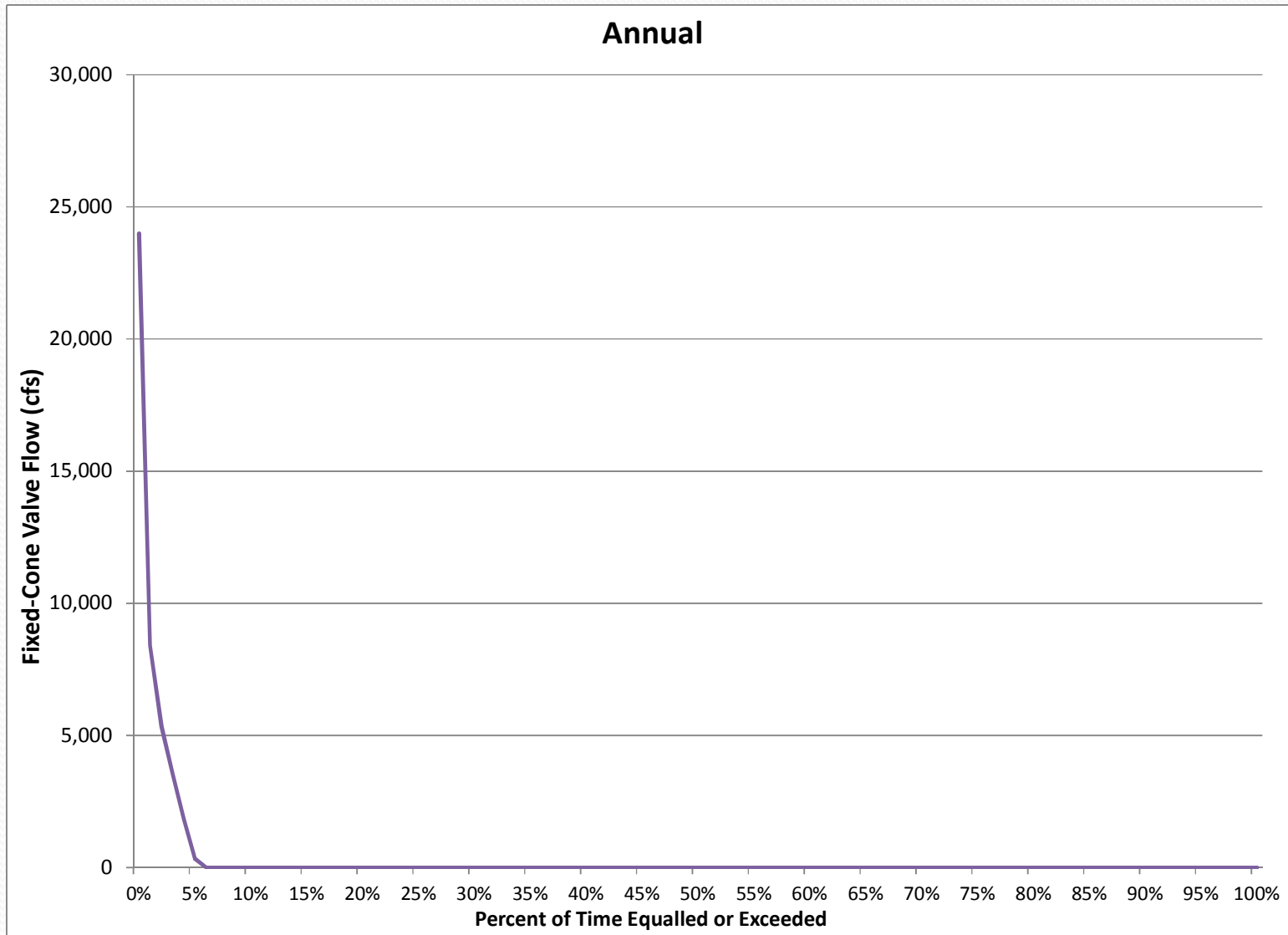
# P4 – Monthly Flow Duration – Fixed-Cone Valves

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
26%	0	0	0	0	0	0	0	2,497	0	0	0	0	0
27%	0	0	0	0	0	0	0	2,165	0	0	0	0	0
28%	0	0	0	0	0	0	0	1,813	0	0	0	0	0
29%	0	0	0	0	0	0	0	1,499	0	0	0	0	0
30%	0	0	0	0	0	0	0	1,260	0	0	0	0	0
31%	0	0	0	0	0	0	0	961	0	0	0	0	0
32%	0	0	0	0	0	0	0	765	0	0	0	0	0
33%	0	0	0	0	0	0	0	508	0	0	0	0	0
34%	0	0	0	0	0	0	0	374	0	0	0	0	0
35%	0	0	0	0	0	0	0	266	0	0	0	0	0
36%	0	0	0	0	0	0	0	44	0	0	0	0	0
37%	0	0	0	0	0	0	0	0	0	0	0	0	0
38%	0	0	0	0	0	0	0	0	0	0	0	0	0
39%	0	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0	0
100%	0	0	0	0	0	0	0	0	0	0	0	0	0

# P4 – Monthly Flow Duration Curves – Fixed-Cone Valves



# P4 – Monthly Flow Duration Curves – Fixed-Cone Valves

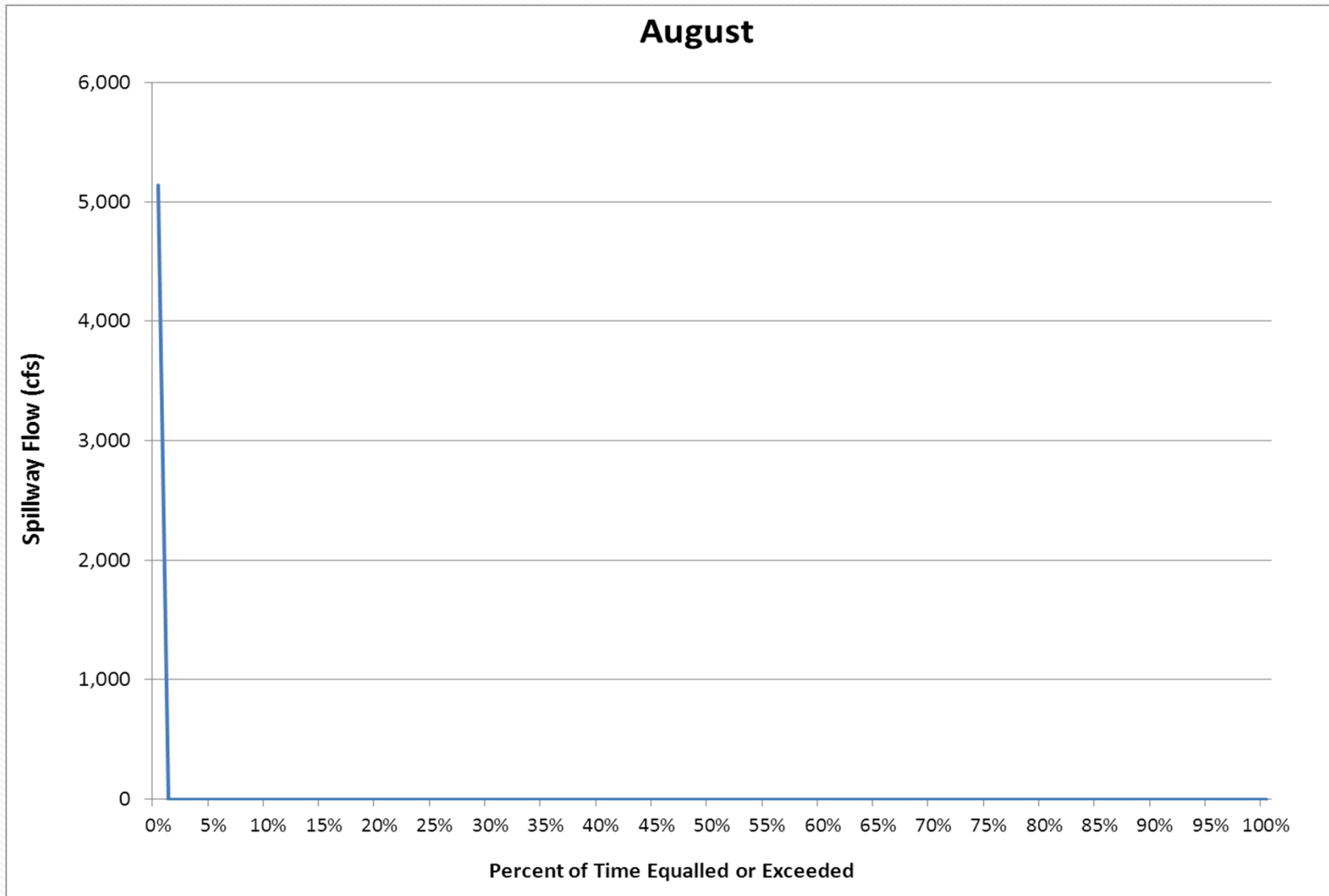


# P4 - Monthly Flow Duration – Spillway

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	0	0	0	0	0	0	0	5,143	0	0	0	0	5,143
1%	0	0	0	0	0	0	0	0	0	0	0	0	0
2%	0	0	0	0	0	0	0	0	0	0	0	0	0
3%	0	0	0	0	0	0	0	0	0	0	0	0	0
4%	0	0	0	0	0	0	0	0	0	0	0	0	0
5%	0	0	0	0	0	0	0	0	0	0	0	0	0
6%	0	0	0	0	0	0	0	0	0	0	0	0	0
7%	0	0	0	0	0	0	0	0	0	0	0	0	0
8%	0	0	0	0	0	0	0	0	0	0	0	0	0
9%	0	0	0	0	0	0	0	0	0	0	0	0	0
10%	0	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0	0
100%	0	0	0	0	0	0	0	0	0	0	0	0	0



# P4 - Monthly Flow Duration Curves – Spillway



# P5 – Monthly Elevation Duration (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	2,025	2,006	1,986	1,967	1,991	2,050	2,050	2,050	2,050	2,050	2,050	2,042	2,050
1%	2,019	1,999	1,978	1,959	1,968	2,030	2,050	2,050	2,050	2,050	2,048	2,036	2,050
2%	2,017	1,998	1,976	1,957	1,964	2,022	2,050	2,050	2,050	2,050	2,047	2,035	2,050
3%	2,016	1,996	1,974	1,955	1,962	2,017	2,050	2,050	2,050	2,050	2,047	2,034	2,050
4%	2,015	1,995	1,973	1,954	1,959	2,012	2,050	2,050	2,050	2,050	2,046	2,033	2,050
5%	2,015	1,994	1,972	1,953	1,958	2,009	2,050	2,050	2,050	2,050	2,046	2,033	2,050
6%	2,014	1,993	1,971	1,953	1,956	2,007	2,050	2,050	2,050	2,050	2,046	2,032	2,050
7%	2,013	1,992	1,971	1,952	1,955	2,005	2,050	2,050	2,050	2,050	2,045	2,032	2,050
8%	2,013	1,992	1,970	1,951	1,954	2,004	2,050	2,050	2,050	2,050	2,045	2,031	2,050
9%	2,013	1,991	1,969	1,951	1,953	2,002	2,049	2,050	2,050	2,050	2,045	2,031	2,050
10%	2,012	1,991	1,969	1,950	1,952	2,001	2,048	2,050	2,050	2,050	2,044	2,031	2,050
11%	2,012	1,990	1,968	1,949	1,951	2,000	2,046	2,050	2,050	2,050	2,044	2,030	2,050
12%	2,011	1,990	1,968	1,949	1,950	1,998	2,045	2,050	2,050	2,050	2,044	2,030	2,050
13%	2,011	1,989	1,967	1,948	1,949	1,997	2,043	2,050	2,050	2,050	2,044	2,030	2,050
14%	2,011	1,989	1,967	1,948	1,949	1,996	2,042	2,050	2,050	2,050	2,044	2,029	2,049
15%	2,010	1,988	1,966	1,947	1,948	1,995	2,041	2,050	2,050	2,050	2,043	2,029	2,049
16%	2,010	1,988	1,966	1,947	1,947	1,994	2,039	2,050	2,050	2,050	2,043	2,029	2,048
17%	2,010	1,987	1,966	1,946	1,947	1,993	2,038	2,050	2,050	2,050	2,043	2,029	2,047
18%	2,009	1,987	1,965	1,946	1,946	1,992	2,037	2,050	2,050	2,050	2,043	2,028	2,046
19%	2,009	1,987	1,965	1,945	1,945	1,991	2,036	2,050	2,050	2,050	2,043	2,028	2,045
20%	2,009	1,986	1,964	1,945	1,944	1,990	2,035	2,050	2,050	2,050	2,043	2,028	2,044
21%	2,009	1,986	1,964	1,944	1,943	1,989	2,035	2,050	2,050	2,050	2,042	2,028	2,043
22%	2,008	1,986	1,964	1,944	1,943	1,988	2,034	2,050	2,050	2,050	2,042	2,027	2,041
23%	2,008	1,985	1,963	1,944	1,942	1,987	2,033	2,050	2,050	2,050	2,042	2,027	2,040
24%	2,008	1,985	1,963	1,943	1,941	1,986	2,032	2,050	2,050	2,050	2,042	2,027	2,039
25%	2,008	1,984	1,963	1,943	1,941	1,985	2,031	2,050	2,050	2,050	2,042	2,027	2,037
26%	2,007	1,984	1,962	1,943	1,940	1,984	2,031	2,050	2,050	2,050	2,041	2,026	2,036
27%	2,007	1,984	1,962	1,942	1,940	1,983	2,030	2,050	2,050	2,050	2,041	2,026	2,035
28%	2,007	1,983	1,962	1,942	1,939	1,983	2,029	2,050	2,050	2,050	2,041	2,026	2,034
29%	2,006	1,983	1,961	1,941	1,938	1,982	2,028	2,050	2,050	2,050	2,041	2,026	2,032
30%	2,006	1,983	1,961	1,941	1,938	1,981	2,027	2,050	2,050	2,050	2,041	2,026	2,031
31%	2,006	1,983	1,961	1,941	1,937	1,980	2,027	2,050	2,050	2,050	2,041	2,025	2,030
32%	2,006	1,982	1,961	1,940	1,937	1,979	2,026	2,050	2,050	2,050	2,040	2,025	2,028
33%	2,005	1,982	1,960	1,940	1,936	1,978	2,025	2,050	2,050	2,050	2,040	2,025	2,027

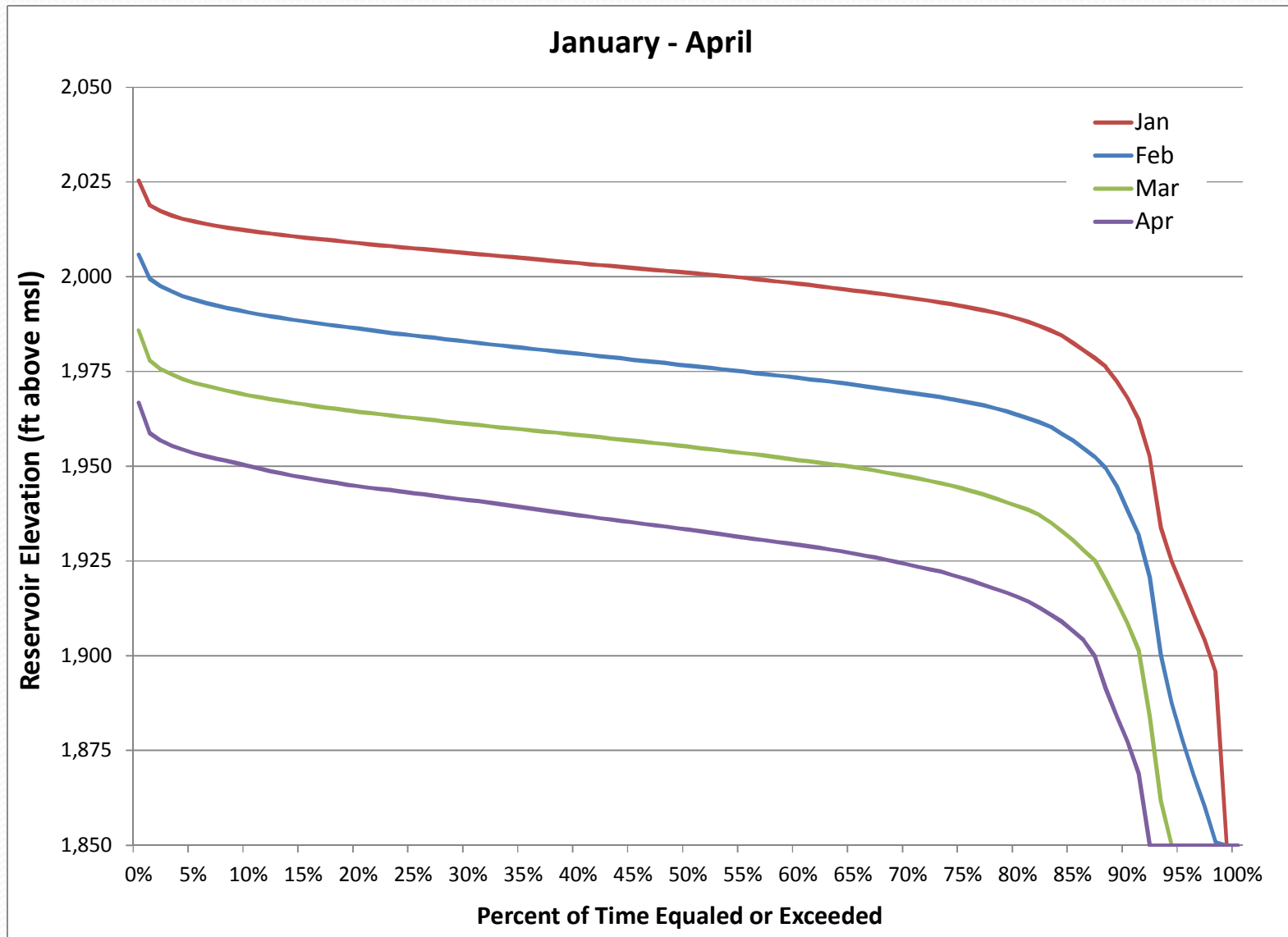
# P5 – Monthly Elevation Duration (2 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	2,005	1,982	1,960	1,940	1,935	1,978	2,025	2,050	2,050	2,050	2,040	2,025	2,025
35%	2,005	1,981	1,960	1,939	1,935	1,977	2,024	2,050	2,050	2,050	2,040	2,024	2,024
36%	2,005	1,981	1,959	1,939	1,934	1,976	2,023	2,050	2,050	2,049	2,040	2,024	2,022
37%	2,004	1,981	1,959	1,938	1,933	1,975	2,022	2,050	2,050	2,049	2,040	2,024	2,021
38%	2,004	1,980	1,959	1,938	1,932	1,975	2,022	2,050	2,050	2,049	2,039	2,024	2,019
39%	2,004	1,980	1,959	1,937	1,931	1,974	2,021	2,050	2,050	2,049	2,039	2,023	2,017
40%	2,004	1,980	1,958	1,937	1,931	1,973	2,020	2,050	2,050	2,049	2,039	2,023	2,016
41%	2,003	1,979	1,958	1,937	1,930	1,972	2,019	2,050	2,050	2,049	2,039	2,023	2,014
42%	2,003	1,979	1,958	1,936	1,929	1,972	2,019	2,050	2,050	2,049	2,039	2,023	2,012
43%	2,003	1,979	1,957	1,936	1,929	1,971	2,018	2,050	2,050	2,049	2,039	2,022	2,011
44%	2,003	1,978	1,957	1,936	1,928	1,970	2,017	2,050	2,050	2,049	2,038	2,022	2,009
45%	2,002	1,978	1,957	1,935	1,927	1,970	2,016	2,050	2,050	2,049	2,038	2,022	2,007
46%	2,002	1,978	1,956	1,935	1,927	1,969	2,016	2,050	2,050	2,049	2,038	2,022	2,006
47%	2,002	1,978	1,956	1,934	1,926	1,968	2,015	2,050	2,050	2,049	2,038	2,022	2,004
48%	2,002	1,977	1,956	1,934	1,926	1,968	2,014	2,050	2,050	2,049	2,038	2,021	2,002
49%	2,001	1,977	1,955	1,934	1,926	1,967	2,014	2,050	2,050	2,049	2,037	2,021	2,001
50%	2,001	1,977	1,955	1,933	1,925	1,966	2,013	2,050	2,050	2,049	2,037	2,021	1,999
51%	2,001	1,976	1,955	1,933	1,925	1,966	2,012	2,049	2,050	2,048	2,037	2,021	1,996
52%	2,001	1,976	1,954	1,932	1,925	1,965	2,011	2,049	2,050	2,048	2,037	2,020	1,995
53%	2,000	1,976	1,954	1,932	1,925	1,964	2,011	2,048	2,050	2,048	2,037	2,020	1,993
54%	2,000	1,975	1,954	1,932	1,924	1,963	2,010	2,047	2,050	2,048	2,037	2,020	1,991
55%	2,000	1,975	1,954	1,931	1,924	1,962	2,009	2,046	2,050	2,048	2,036	2,020	1,989
56%	1,999	1,975	1,953	1,931	1,923	1,962	2,009	2,046	2,050	2,048	2,036	2,019	1,987
57%	1,999	1,974	1,953	1,930	1,922	1,961	2,008	2,045	2,050	2,048	2,036	2,019	1,985
58%	1,999	1,974	1,952	1,930	1,922	1,960	2,007	2,044	2,050	2,048	2,036	2,019	1,983
59%	1,998	1,974	1,952	1,930	1,921	1,959	2,006	2,043	2,050	2,048	2,036	2,019	1,981
60%	1,998	1,973	1,952	1,929	1,921	1,958	2,006	2,042	2,050	2,048	2,035	2,018	1,979
61%	1,998	1,973	1,951	1,929	1,920	1,958	2,005	2,041	2,050	2,048	2,035	2,018	1,977
62%	1,997	1,973	1,951	1,928	1,920	1,957	2,004	2,040	2,050	2,047	2,035	2,018	1,975
63%	1,997	1,972	1,951	1,928	1,919	1,956	2,003	2,039	2,050	2,047	2,035	2,018	1,973
64%	1,997	1,972	1,950	1,928	1,919	1,955	2,002	2,038	2,050	2,047	2,034	2,017	1,971
65%	1,996	1,972	1,950	1,927	1,918	1,955	2,001	2,037	2,050	2,047	2,034	2,017	1,970
66%	1,996	1,971	1,949	1,926	1,917	1,954	2,000	2,036	2,050	2,047	2,034	2,017	1,968

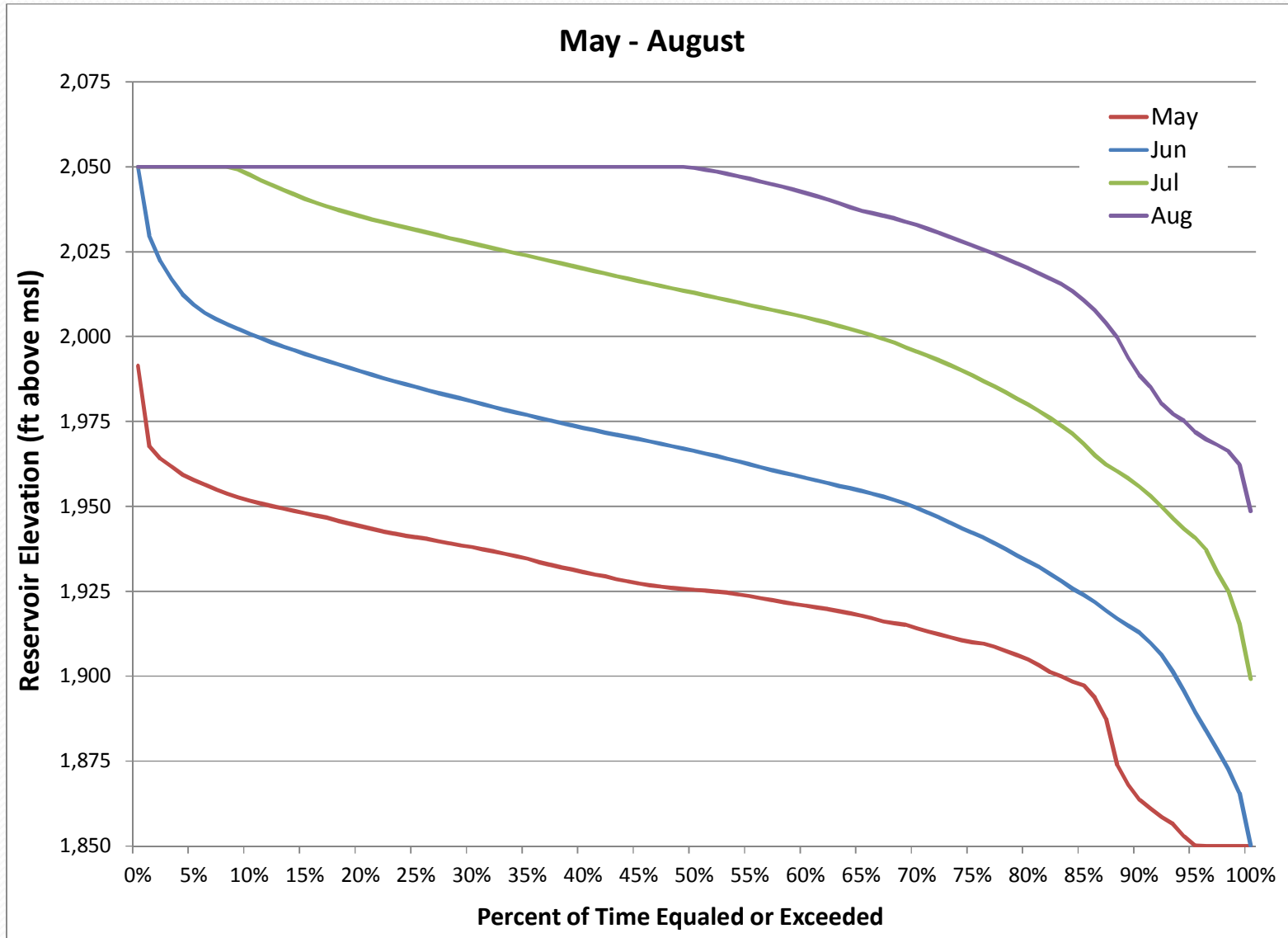
# P5 – Monthly Elevation Duration (3 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	1,996	1,971	1,949	1,926	1,916	1,953	1,999	2,036	2,050	2,047	2,034	2,016	1,966
68%	1,995	1,970	1,948	1,925	1,916	1,952	1,998	2,035	2,050	2,047	2,034	2,016	1,964
69%	1,995	1,970	1,948	1,925	1,915	1,951	1,997	2,034	2,050	2,046	2,033	2,016	1,963
70%	1,994	1,970	1,947	1,924	1,914	1,950	1,996	2,033	2,049	2,046	2,033	2,016	1,961
71%	1,994	1,969	1,947	1,923	1,913	1,948	1,994	2,032	2,048	2,046	2,033	2,015	1,959
72%	1,994	1,969	1,946	1,923	1,912	1,947	1,993	2,031	2,048	2,046	2,032	2,015	1,958
73%	1,993	1,968	1,946	1,922	1,911	1,945	1,992	2,029	2,047	2,046	2,032	2,015	1,956
74%	1,993	1,968	1,945	1,921	1,911	1,944	1,990	2,028	2,046	2,046	2,032	2,014	1,955
75%	1,992	1,967	1,944	1,921	1,910	1,942	1,989	2,027	2,044	2,045	2,032	2,014	1,953
76%	1,992	1,967	1,943	1,920	1,910	1,941	1,987	2,026	2,043	2,045	2,031	2,013	1,951
77%	1,991	1,966	1,942	1,919	1,909	1,939	1,985	2,024	2,042	2,045	2,031	2,013	1,950
78%	1,990	1,965	1,941	1,918	1,907	1,937	1,984	2,023	2,042	2,044	2,030	2,012	1,948
79%	1,990	1,964	1,940	1,917	1,906	1,936	1,982	2,022	2,041	2,044	2,030	2,012	1,946
80%	1,989	1,964	1,939	1,916	1,905	1,934	1,980	2,020	2,040	2,043	2,029	2,011	1,944
81%	1,988	1,963	1,938	1,914	1,903	1,932	1,978	2,019	2,038	2,042	2,029	2,011	1,942
82%	1,987	1,962	1,937	1,913	1,901	1,930	1,976	2,017	2,038	2,041	2,028	2,010	1,941
83%	1,986	1,960	1,935	1,911	1,900	1,928	1,974	2,015	2,037	2,038	2,026	2,009	1,939
84%	1,984	1,959	1,933	1,909	1,898	1,926	1,971	2,013	2,037	2,035	2,025	2,008	1,937
85%	1,983	1,957	1,930	1,907	1,897	1,924	1,968	2,011	2,036	2,035	2,023	2,006	1,935
86%	1,981	1,955	1,928	1,904	1,894	1,922	1,965	2,008	2,033	2,034	2,022	2,004	1,932
87%	1,978	1,952	1,925	1,900	1,887	1,919	1,962	2,004	2,032	2,032	2,020	2,003	1,930
88%	1,976	1,950	1,920	1,891	1,874	1,917	1,960	2,000	2,030	2,031	2,019	2,001	1,928
89%	1,972	1,945	1,914	1,884	1,868	1,915	1,958	1,994	2,028	2,030	2,016	1,998	1,926
90%	1,968	1,938	1,909	1,877	1,864	1,913	1,956	1,989	2,020	2,028	2,014	1,994	1,924
91%	1,962	1,932	1,901	1,869	1,861	1,910	1,953	1,985	2,015	2,026	2,010	1,989	1,921
92%	1,953	1,921	1,884	1,850	1,859	1,906	1,950	1,980	2,011	2,012	2,000	1,979	1,917
93%	1,934	1,900	1,862	1,850	1,857	1,901	1,946	1,977	2,004	2,006	1,987	1,964	1,914
94%	1,925	1,888	1,850	1,850	1,853	1,896	1,943	1,975	1,995	1,993	1,978	1,956	1,909
95%	1,918	1,878	1,850	1,850	1,850	1,890	1,941	1,972	1,992	1,991	1,972	1,951	1,903
96%	1,911	1,869	1,850	1,850	1,850	1,884	1,937	1,970	1,989	1,986	1,968	1,945	1,891
97%	1,904	1,860	1,850	1,850	1,850	1,878	1,931	1,968	1,986	1,983	1,964	1,938	1,872
98%	1,896	1,851	1,850	1,850	1,850	1,873	1,925	1,966	1,983	1,977	1,959	1,931	1,852
99%	1,850	1,850	1,850	1,850	1,850	1,866	1,915	1,962	1,964	1,954	1,930	1,897	1,850
100%	1,850	1,850	1,850	1,850	1,850	1,850	1,899	1,949	1,959	1,941	1,912	1,868	1,850

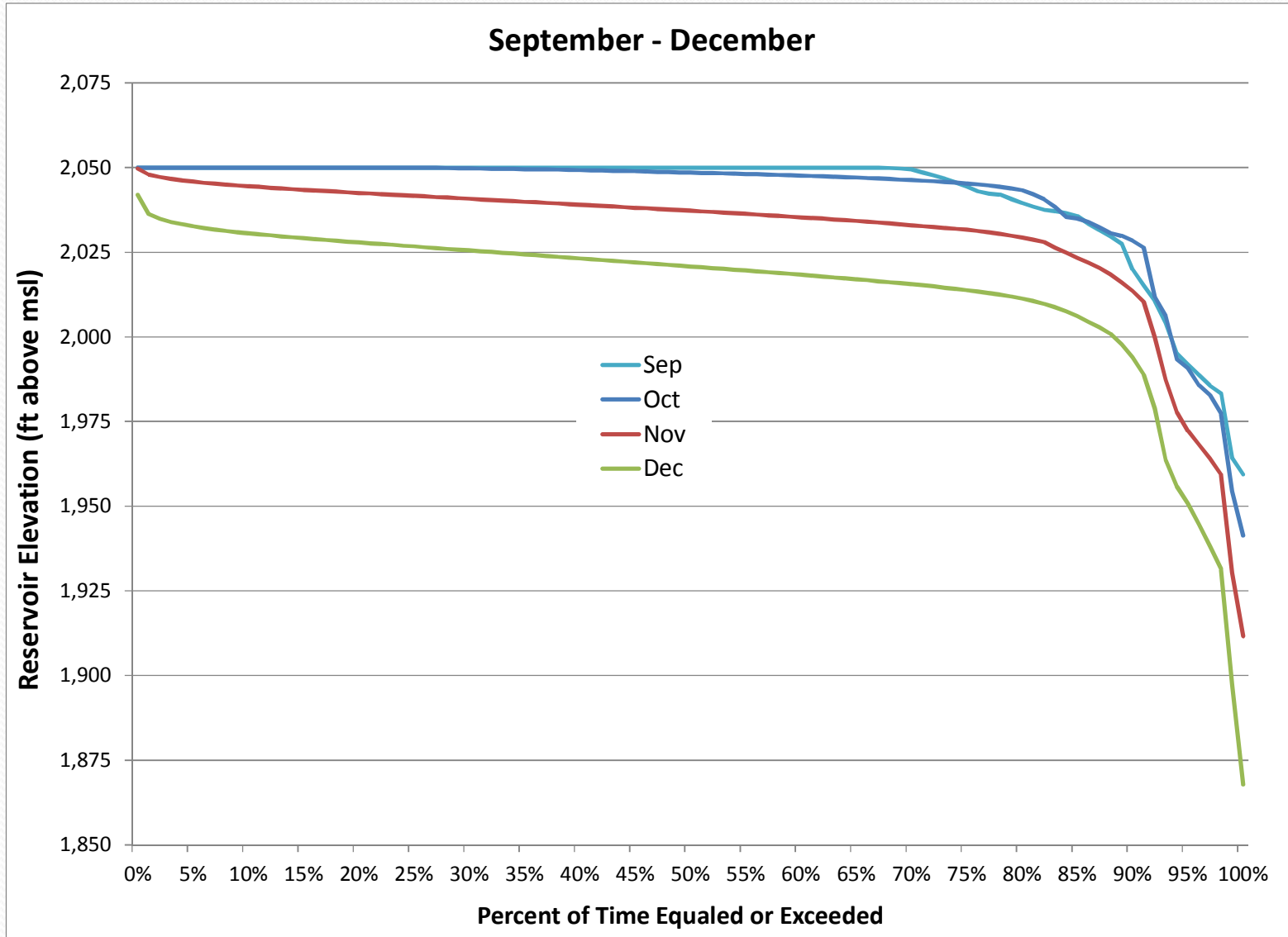
# P5 – Monthly Elevation Duration Curves



# P5 – Monthly Elevation Duration Curves



# P5 – Monthly Elevation Duration Curves



# P5 – Monthly Elevation Duration Curves

