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April 25, 2012

Via Electronic Mail And First Class U. S. Mail

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, California 95812-0100
commentletters@waterboards.ca.gov

Re: Comment Letter of Yuba County Water Agency – Bay-Delta Plan Supplemental Notice of Preparation – Comprehensive Review

Dear Ms. Townsend:

Our firm represents the Yuba County Water Agency (YCWA). YCWA appreciates the opportunity to submit these comments pursuant to the Supplemental Notice of Preparation (NOP) and Notice of Scoping Meeting for the Update and Implementation of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan): Comprehensive Review that the State Water Resources Control Board (SWRCB) issued on January 24, 2012. In addition to these comments, YCWA joins in the comments of the Sacramento Valley Water Users, of which YCWA is a member.

1. Summary of Comments

In the SWRCB's pending water quality proceeding concerning San Joaquin River basin streamflows, the SWRCB is considering streamflow objectives that would be based on percentages of unimpaired flows, and that would be above the percentages of unimpaired flows that currently flow out of that basin. YCWA has modeled the hydrologic impacts that would occur in the Yuba River basin if the SWRCB were to take an approach in the Sacramento River basin and the Bay-Delta similar to the one it is proposing to take for the San Joaquin River basin. YCWA's modeling report is enclosed. That report indicates that implementing Bay-Delta water quality objectives based on 50% or 40% of unimpaired flows for the January-June period would have severe impacts on storage in New Bullards Bar Reservoir – with the reservoir reaching minimum pool levels during multiple months in multi-year droughts – and would result in significant shifts of streamflows from the summer and fall to the spring.

These hydrological impacts would cause significant water-supply and environmental impacts. As a result, if the SWRCB were to seek to base new Bay-Delta outflow requirements on 50% or 40% of January-June unimpaired Delta outflows, then the Porter-Cologne Water Quality Control Act ("Porter-Cologne") and CEQA would require the SWRCB to analyze potentially significant impacts in at least the following categories: (1) special-status and migratory fisheries; (2) water supplies; (3) groundwater resources; (4) farmland and associated terrestrial and migratory bird species; (5) hydroelectric generation, air quality and greenhouse gasses; (6) aesthetics and recreation; (7) population; and (8) flood hazards.

To consider a full range of reasonable alternatives and to meet CEQA's requirement that CEQA lead agencies consider alternatives that would reduce significant environmental impacts, the SWRCB must consider Bay-Delta streamflow objectives that would be based on the Sacramento River's inflows to the Delta that are generated by recently-implemented streamflow measures on the Sacramento Valley's rivers. Within the last 10 years, the SWRCB has issued orders implementing the Lower Yuba River Accord, which was developed by YCWA, the Department of Fish and Game (DFG), the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS) and environmental groups. The SWRCB also has issued a water quality certification for the Department of Water Resources' (DWR) relicensing of the Oroville facilities on the Feather River. In addition, NMFS's 2009 biological opinion for the CVP and SWP incorporated the American River flow management standard developed by the Water Forum in conjunction with DFG, NMFS and USFWS, and Sacramento River flow management standards. All of these recent streamflow measures are part of the environmental baseline that the SWRCB must use under CEQA. These recent streamflow measures should form the basis of a project alternative for any new Bay-Delta water quality objectives that is based on the total Delta inflows from the Sacramento River basin that result from implementation of those measures.

2. YCWA's Collaborative Implementation Of The State's Coequal Goals Under The Yuba River Accord

As the SWRCB is aware, YCWA has been involved in successful collaborations with environmental groups and local, state and federal agencies, with the most significant effort resulting in the Lower Yuba River Accord. This settlement agreement ended 20 years of disputes and litigation by addressing water-supply and fishery needs in the lower Yuba River and has led to significant economic and environmental benefits for California. Higher instream flows for Chinook salmon and steelhead and other fish and wildlife species during critical months, an unprecedented fisheries monitoring and evaluation program and environmentally-responsible water transfers of hundreds of thousands of acre-feet of water are some of the Yuba River Accord's most important benefits. In its Corrected Order No. WR 2008-0014, the SWRCB authorized YCWA to implement the Accord's streamflow schedules by amending YCWA's water-right permits to incorporate those schedules. The Accord has been selected for the 2009 Governor's Environmental and Economic Leadership Award, the National Hydropower Association's 2009 Outstanding Stewards of America's Water Award and the Association of California Water Agencies' 2008 Theodore Roosevelt Environmental Award.

In 2009's Senate Bill 1, the Legislature enacted the following state policy for the management of the Delta: "Achieve the two coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem." Implementation of these coequal goals would be consistent with Porter-Cologne's mandate that water quality objectives reasonably protect water quality. (Water Code §§ 13000; 13050, subd. (h); 13170; 13241.)

The Yuba River Accord already achieves the coequal goals. The Accord is an integrated set of three agreements that: (1) establish streamflows to protect Chinook salmon and steelhead, which migrate through the Delta; (2) conjunctively manage YCWA's irrigation deliveries and Yuba County's groundwater; and (3) transfer a portion of the water released to satisfy the Accord's streamflow requirements to the SWP and the CVP.[1] The Accord's streamflow schedules dedicate to fisheries 70% to 189% of the inflow to YCWA's New Bullards Bar Reservoir in nearly all dry and critical years. (See enclosed technical report, p. 5, fig. 3.) The two Accord streamflow schedules within the lower Yuba River's optimal range for fisheries are expected to occur over a combined total of approximately 78% of water years. (Yuba River Accord draft EIR, p. 3-7.)[2]

3. <u>YCWA's Hydrologic Analysis Indicates That CEQA Would Require The SWRCB To Consider Numerous Significant Water-Supply And Environmental Impacts If It Were To Consider New Bay-Delta Streamflow Objectives Based on 50% Or 40% Of Unimpaired Flows</u>

If the SWRCB were to follow the proposed approach for its pending proceeding concerning San Joaquin River basin streamflow objectives for the Sacramento River basin and the Bay-Delta, then CEQA would require the SWRCB to analyze numerous significant environmental impacts because implementation of such objectives would have very significant hydrological impacts that would trigger significant environmental impacts in many resource categories. Based on the SWRCB's San Joaquin proceeding, YCWA has assumed that the SWRCB would consider new Bay-Delta water quality objectives based on 50% and 40% of unimpaired flows and has modeled the impacts that implementing such objectives would have in the Yuba River basin. As discussed in more detail below, many significant impacts would occur in this basin. Preliminarily, however, the SWRCB's NOP does not comply with CEQA's requirements.

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[1] All of the agreements that constitute the Yuba River Accord are available on-line on YCWA's Web site at http://www.ycwa.com/projects/detail/8.

[2] The final Yuba River Accord EIR, which includes the DEIR, is part of the SWRCB's administrative record for Corrected Order WR 2008-0014.

A. The SWRCB's NOP Does Not Contain An Adequate Project Description And Improperly Segments The SWRCB's Environmental Analysis

The CEQA Guidelines require that a notice of preparation describe the relevant project:

> The notice of preparation shall provide the responsible and trustee agencies and the Office of Planning and Research with sufficient information describing the project and the potential environmental effects to enable the responsible agencies to make a meaningful response. At a minimum, the information shall include:
>
> (A) Description of the project . . .
>
> (C) Probable environmental effects of the project . . . .

(Cal Code Regs., tit. 14, § 15082, subd. (a)(1).)

The SWRCB's January 24, 2012 NOP, however, states, on pages three and four:

> In addition to the issues identified in the 2009 Staff Report, the State Water Board will also consider other potential changes to the Bay-Delta Plan that were not specifically addressed in the report, including issues that are identified through the scoping process. The State Water Board may also consider information that is produced as part of the Bay Delta Conservation Plan (BDCP) currently being developed . . . .
>
> Specifically, the State Water Board seeks input and information to support whether the water quality objectives and associated program of implementation discussed above should be modified or whether they should remain the same. In particular, the State Water Board seeks input and information to support whether Delta outflows, Delta inflows, and water project operational constraints should be increased, decreased, or remain the same.

These portions of the NOP indicate that the SWRCB currently has no firm project description for its next phase of its Bay-Delta water quality control plan update, which means that the SWRCB's January 24, 2012 NOP is inconsistent with the CEQA Guidelines.

The manner in which the SWRCB is phasing its environmental review of possible updates to the Bay-Delta water quality control plan also is inconsistent with CEQA. The SWRCB is preparing a draft substitute environmental document (SED) for its update to south Delta salinity and San Joaquin River flow objectives and its staff intends to present that SED to the SWRCB for possible certification in 2012. It will take substantially longer for the SWRCB to complete a technically sufficient analysis of hydrological, environmental and other considerations that would be involved with new water quality objectives concerning Sacramento River inflows to the Delta and Delta outflows. If the SWRCB were to complete its SED for San Joaquin River inflows and then simply assume those flows' existence in later CEQA documents concerning Sacramento River inflows and Delta outflows, then it would have improperly segmented its consideration of all of the environmental impacts associated with each of those flow objectives. In addition, because it is reasonably foreseeable that the methods by which the SWRCB would implement any new Bay-Delta water quality objectives setting Delta flows would include water-right changes and changes to water-project operations, the SWRCB's CEQA document must analyze the impacts that such changes would have. (See *Laurel Heights Improvements Ass'n v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376, 396-399.)

B. YCWA's Hydrologic Analysis Indicates That Implementing New Bay-Delta Flow Objectives Based On 50% And 40% Of Unimpaired Flows Would Have Significant Hydrologic Impacts In The Yuba River Basin

YCWA conducted hydrologic modeling of the impacts that implementing Bay-Delta flow objectives based on 50% and 40% of January-June unimpaired flows would have on the hydrology of the Yuba River basin.[3] A copy of YCWA's technical report that describes how it modeled the impacts of such possible objectives and the results of its modeling is enclosed. In summary, YCWA's modeling shows:

- Significantly reduced reservoir storage in multi-dry year droughts. Implementation of such objectives would cause severely-reduced water storage in New Bullards Bar Reservoir for much of the durations of multi-year droughts, with the reservoir reaching minimum pool levels for some periods during those droughts. (Enclosed report, pp. 12-15.)

- Significantly reduced average reservoir storage – Implementation of such objectives would reduce end-of-September carryover storage in New Bullards Bar Reservoir by over 100,000 acre-feet in approximately 50% of years, with the impact reaching approximately 250,000 acre-feet in some drier years. (Enclosed report, pp. 14-15.)

- Significantly reduced summer and fall streamflows – Implementation of such objectives would shift significant percentages of streamflows from the summer

[3]YCWA's modeling assumes that diversions of water from the Yuba basin to adjacent basins by hydroelectric projects licensed by the Federal Energy Regulatory Commission would continue. This assumption is based on the SWRCB's statement in Revised Water Right Decision 1644 that the SWRCB decided to hold YCWA solely responsible for implementing all lower Yuba River streamflow requirements because, "[i]n the case of those projects that divert water from the upper Yuba River solely for the production of hydropower under a license from FERC, the SWRCB's jurisdiction to independently establish instream flow requirements as a condition of a water right permit has been preempted by federal law." (Revised Water Right Decision 1644, p. 150.)

and fall summer months – when salmon and steelhead are holding and spawning in the Yuba River – to spring months. (Enclosed report, pp. 8-12.)

- Significant negative shifts in Yuba River Accord streamflow schedules – The Yuba River Accord's foundation is streamflow schedules that allocate water to support the river's salmon and steelhead, with Schedules 1 and 2 representing the range of optimal fishery conditions and the higher-numbered schedules representing progressively lower minimum flows for these fish. YCWA's modeling shows that implementing new Bay-Delta streamflow objectives based on 50% or 40% of unimpaired flows would cause shifts to higher numbered Accord streamflow schedules – resulting in lower streamflows – in nine of 29 years for the 50% scenario, and seven of 29 years for the 40% scenario, in the modeled 1976-2003 period. (Enclosed report, pp. 15-17.)

- Significant increases in water temperatures in drier years – Implementation of January-June streamflow objectives based on 50% or 40% of unimpaired flows would cause the temperatures of water released from New Bullards Bar Reservoir to increase in drier years, resulting in significantly increased water temperatures in the lower Yuba River, which salmon and steelhead use as habitat. (Enclosed report, pp. 18-19.)

- Significant shortages in irrigation deliveries – YCWA's modeling shows that implementing such objectives would cause irrigation delivery shortages in most years, with objectives based on: (1) 50% of unimpaired flows causing shortages over 20% in approximately 25% of years and over 60% in approximately 10% of years; and (2) 40% of unimpaired flows causing shortages over 20% in approximately 10% of years. (Enclosed report, pp. 20-22.)

C. The Hydrologic Impacts Identified In YCWA's Modeling Would Trigger Significant Impacts That The SWRCB Must Analyze Under Porter-Cologne And CEQA

One of the NOP's purposes is the identification of significant environmental impacts. (Cal. Code Regs., tit. 14, §§ 15082(b)(1)(A); 15083, subd. (a).) The SWRCB's January 24, 2012 NOP also indicates that the SWRCB is seeking input under Porter-Cologne concerning what water quality objectives to consider. The significant hydrologic impacts that YCWA's modeling indicates would occur if the SWRCB were to implement new Bay-Delta water quality objectives based on 50% or 40% of unimpaired flows indicate that, in order to comply with Porter-Cologne and CEQA in considering any such objectives, the SWRCB must analyze at least the following types of impacts:

- Special-status and migratory fisheries – The reduced streamflows, shifted streamflows and increased water temperatures that would occur in the lower Yuba River if such objectives were implemented would detrimentally affect spring-run Chinook salmon, fall-run Chinook salmon and steelhead, and other fish species. As the SWRCB is aware, spring-run Chinook salmon and steelhead are listed as threatened species under the federal Endangered Species Act. Fall-run Chinook salmon is a species of special management concern for California. Such significant impacts on special-status and migratory species require analysis under CEQA. (See Cal. Code Regs., tit. 14, Appendix G, items IV.a) and IV.d).) These impacts will reach levels that mandate a finding of significance. (See Cal. Code Regs., tit. 14, Appendix G, item XVIII.a).)

- <u>Water supplies</u> – As discussed above, YCWA's analysis indicates that implementing Delta water quality objectives based on 50% or 40% of unimpaired flows would substantially reduce YCWA's surface-water deliveries. Porter-Cologne requires that the SWRCB consider all water-supply impacts because it requires the SWRCB to consider, in developing water quality objectives, "[p]ast, present, and probable future beneficial uses of water" and "economic considerations," among other factors. (Water Code § 13241, subds. (a), (d).)

- <u>Groundwater resources</u> – The reductions in surface-water deliveries that implementing water quality objectives based on 50% or 40% of unimpaired flows would cause significant impacts on groundwater resources in Yuba County. Southern Yuba County's aquifer was significantly overdrafted before YCWA began delivering surface water to that area, but now has recovered to historic levels. (DWR, Bulletin 160-09, *Cal. Water Plan, 2009 Update*, vol. 2, p. 8-20.) Water quality objectives whose implementation would significantly reduce YCWA's deliveries would trigger significantly increased levels of groundwater pumping, which could lead to a renewed overdraft. Accordingly, if the SWRCB were to consider adopting and implementing such water quality objectives, then it must analyze the resulting significant impacts on groundwater supplies. (See Cal. Code Regs., tit. 14, Appendix G, item IX.b).)

- <u>Farmland and associated terrestrial and migratory bird species</u> – The water-supply reductions resulting from implementation of Bay-Delta water quality objectives based on 50% or 40% of unimpaired flows would result in significant environmental impacts to farmland in Yuba County. If such objectives were implemented, then it would not be possible to sustain the levels of groundwater pumping that would be necessary to replace the lost surface supplies and some farmland would have to go out of production. This loss of farmland would be a significant environmental impact. (See Cal. Code Regs., tit. 14, Appendix G, item II.a).)

  The loss of this farmland would result in the loss of habitat for terrestrial species that currently occupy irrigated farmland, as well as significant numbers of waterfowl and migratory birds that use Yuba County fields as part of the Pacific Flyway. In addition, reduced irrigated acreage available for migratory birds' use during the fall rice-straw-decomposition season could result in increased outbreaks of diseases, like avian cholera, among those birds. The impacts on terrestrial species, migratory birds and their habitats likely would be significant and potentially would reach levels that mandate a finding of significance. (See Cal. Code Regs., tit. 14, Appendix G, items IV.a), IV.b), XVIII.a).)

- Hydroelectric generation, air quality and greenhouse gasses – YCWA's New Colgate Powerhouse is powered by water from storage in New Bullards Bar Reservoir and operates as one of California's largest hydroelectric power peaking plants. The reduced New Bullards Bar storage and significant seasonal shifts in streamflows that implementation of water quality objectives based on 50% or 40% of unimpaired flows would significantly impact YCWA's hydroelectric generation in at least two ways. First, generation would be shifted from the high-demand summer and fall months to the low-demand spring months. Second, lost storage would significantly reduce New Colgate's ability to generate electricity to meet temporary demand peaks, such as during weekday summer afternoons. This impact would be particularly severe during drier years when New Bullards Bar's storage would be significantly reduced at the same time as for other reservoirs with storage-based peaking capacity. The SWRCB must consider such impacts under Porter-Cologne. (See Water Code § 13241, subds. (a), (d).) Because this lost generation would have to be replaced by new generation, this impact also must be considered under CEQA. (See Cal. Code Regs., tit. 14, Appendix G, item XIV.a).)

  Because lost hydroelectric generation might have to be replaced by generation relying on fossil fuels, the SWRCB also must consider the air quality and greenhouse-gas impacts that would be associated with the required replacement generation. (See Cal. Code Regs., tit. 14, Appendix G, item III.a)-c), VII.a)-b).) In light of these likely impacts, the California Global Warming Solutions Act of 2006 – AB 32 – also would require the SWRCB to consider the greenhouse-gas impacts of implementing water quality objectives based on 50% or 40% of unimpaired flows. (Health & Safety Code § 38592, subd. (a).)

  Finally, because implementing water quality objectives based on 50% or 40% of unimpaired flows would indirectly cause increased groundwater pumping, implementing such objectives also would cause some combination of increased use of diesel-powered pumps and increased electrical demands from electrical pumps. Increased use of either kind of pump would result in increased air quality impacts that the SWRCB's CEQA analysis must consider. (See Cal. Code Regs., tit. 14, Appendix G, item III.a)-c), VII.a)-b).)

- Aesthetics and recreation – New Bullard Bar Reservoir supports significant levels of recreation and aesthetic enjoyment. The severe impacts on the reservoir's storage resulting from the implementation of implementing water quality objectives based on 50% or 40% of unimpaired flows would cause the reservoir to become much less pleasing aesthetically as it would feature a large "bathtub ring" much more often. In addition, the significant shift of streamflows in the lower Yuba River from the high-recreation summer months to the low-recreation spring months would reduce the river's value as a recreational resource during the time of maximum exposure. These aesthetic and recreational impacts would be significant and the SWRCB must analyze them under CEQA. (See Cal. Code Regs., tit. 14, Appendix G, item I.a), I.b), I.c), XV.) These impacts also would be significant economically, so the SWRCB must consider them under Porter-Cologne. (Water Code § 13241.)

- Population – Yuba County is relatively disadvantaged economically. (See Yuba Accord DEIR, Chapter 17.1.1.) The reliable and affordable water supply available from the Yuba River and YCWA is one of Yuba County's key economic assets. Due to the significant impacts to YCWA's water supplies that would result from implementing water quality objectives based on 50% or 40% of unimpaired flows, the value of this key asset would be reduced, and there could be some shift of population out of Yuba County to other areas of California. This population shift would be a significant impact that CEQA would require the SWRCB to analyze. (See Cal. Code Regs., tit. 14, Appendix G, item XIII.a), XIII.c).)

- Flood hazards – Yuba County is one of the most flood-prone areas of the state, with major floods having occurred in 1955, 1964, 1986 and 1997.[4] YCWA has used the proceeds of its water transfers under the Yuba River Accord to fund, among other things, significant flood-control improvements in Yuba County. These improvements have included a new setback levee along the Feather River. Implementation of Bay-Delta water quality objectives reflecting 50% or 40% of unimpaired flows could significantly reduce YCWA's capacity to transfer water because New Bullards Bar Reservoir's storage would be significantly reduced. Accordingly, implementing those objectives would indirectly reduce flood control in Yuba County and would result in significant impacts that CEQA would require the SWRCB to analyze. (See Cal. Code Regs., tit. 14, Appendix G, item IX.i).) This impact could rise to mandatory significance. (See Cal. Code Regs., tit. 14, Appendix G, item XVIII.c).)

[4] The 1986 Yuba County flood resulted in the State of California paying hundreds of millions of dollars in damages. (See generally *Paterno v. State of California* (2003) 113 Cal.App.4th 998.)

4. The SWRCB's CEQA Baseline Includes The On-Going Implementation Of Recent Sacramento Valley Streamflow Measures Like The Yuba River Accord And The SWRCB Must Analyze A Project Alternative That Would Rely On The Delta Inflows Provided By Those Measures

The baseline for CEQA analysis normally is the physical environmental conditions existing when the NOP is published. (Cal. Code Regs., tit. 14, § 15125, subd. (a).) CEQA requires the lead agency to consider project alternatives that would avoid or reduce significant or potentially significant environmental impacts. (Public Resources Code §§ 21001, subd. (g); 21002; 21002.1, subd. (a); 21061; 21080.5, subds. (d)(2)(A), (d)(3)(A); Cal. Code Regs., tit. 14, §§ 15126.6(a); 15252, subd. (a)(2)(A).) In light of the numerous significant environmental impacts that would result from implementing water quality objectives based on 50% or 40% of unimpaired flows, the SWRCB must consider project alternatives.

The SWRCB's CEQA baseline includes, and a project alternative for any new Bay-Delta water quality objectives must be based on, the Delta inflows from the Sacramento River that presently occur as a result of recently-adopted streamflow measures in Sacramento Valley rivers like the Yuba River Accord. As discussed above (see section two), the Accord's streamflow schedules maintain optimal conditions for salmonids in the lower Yuba River in 78% of water years, while providing water-supply reliability within Yuba County and improving such reliability for SWP and CVP export contractors. The Accord also has increased Sacramento River inflows to the Delta. In 2007, 2008 and 2009, the Accord's implementation increased Delta spring inflows by an average of 55,000 acre-feet a year. (Grinnell, *Analysis of Potential Impacts to the Yuba River Accord and Lower Yuba River Public Trust Resources If the SWRCB's Proposed 2010 Delta Flow Criteria Were Implemented* (January 2012) p. 4 (submitted to Delta Stewardship Council with YCWA's comments on draft Delta Plan EIR).) As discussed in more detail in the Sacramento Valley Water Users' comments on the SWRCB's NOP, other significant streamflow measures now govern the Sacramento Valley's other major rivers. These measures include:

- American River – The 2006 Water Forum flow management standard, as incorporated by NMFS into its 2009 biological opinion for CVP and SWP operations;

- Bear River – The settlement agreement among DWR and Bear River water users concerning Bay-Delta flow contributions, as implemented by the SWRCB's Order WR 2000-10;

- Feather River – The water quality certification that the SWRCB issued in 2010 for DWR's relicensing of its Oroville facilities; and

- Sacramento River – Streamflow requirements stated in, among other sources, the SWRCB's Orders 90-05 and 91-01 and in NMFS's 2009 biological opinion for the CVP and the SWP.

Implementation of these measures generally began during the last 10 years – after the Bay-Delta's pelagic organism decline began. Those measures generally have had, as a major goal, the improvement of conditions for fisheries. Careful reservoir management to ensure that instream conditions are appropriate for salmonids is a key part of many of those measures. The SWRCB must not essentially unravel these measures by adopting Bay-Delta water quality objectives based on percentages of unimpaired flows that would dramatically reduce – and even negate management of – the storage in the Sacramento Valley's reservoirs like YCWA's New Bullards Bar Reservoir.

5. Conclusion

YCWA appreciates the opportunity to provide these comments on the scope of possible new Bay-Delta water quality objectives and the SWRCB's related environmental analysis. YCWA's modeling of the effects of implementing new objectives based on 50% or 40% of January-June unimpaired flows indicates that implementing such objectives essentially would undermine the Yuba River Accord's achievement of the state's coequal goals and would trigger significant adverse impacts across many economic and environmental categories. Along with the Sacramento Valley Water Users, YCWA therefore urges the SWRCB instead to base any new Bay-Delta water quality objectives on the Sacramento River basin inflows to the Delta that streamflow measures recently implemented throughout the basin currently are generating.

Very truly yours,

BARTKIEWICZ, KRONICK & SHANAHAN

Alan B. Lilly

Attorneys for Yuba County Water Agency

Encl: April 2012 Technical Report by Stephen E. Grinnell, "Analysis of SWRCB Potential Approach to New Flow Criteria for the Bay-Delta Water Quality Control Plan Update"

7021\Bay-Delta\L042312 Scoping Comments

Analysis of SWRCB Potential Approach to New Flow Criteria for the Bay-Delta Water Quality Control Plan Update

Prepared By: **Stephen E. Grinnell, P.E.**
Prepared for: **Yuba County Water Agency**

April 23, 2012

REPORT OVERVIEW

This report summarizes the formulation of an analysis and results to examine the impacts that would occur in the lower Yuba River watershed and to the Lower Yuba River Accord, as well as to other beneficial uses of water, if 40 percent or 50 percent of unimpaired Yuba River flow were required as a minimum Yuba River outflow.

On August 3, 2010, the State Water Resources Control Board (SWRCB) adopted Resolution 2010-0039, approving the report titled, "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" (SWRCB Report) (SWRCB 2010). The SWRCB Report identified new flow criteria for the Sacramento-San Joaquin Delta ecosystem (Delta) for the purpose of protecting public trust resources pursuant to California Water Code Section 85086 (of the 2009 Delta Reform Act). The flow criteria were based on a percentage of unimpaired flow for the location of interest (e.g. Delta Outflow and Sacramento River Inflow to the Delta).

More recently, the SWRCB staff has indicated in its proceedings on the potential amendments to the San Joaquin River flow objectives in the 2006 Bay-Delta Water Quality Control Plan (WQCP) that it is considering basing new flow criteria on a specified percentage of unimpaired flows. The SWRCB is now implementing scoping for the second phase of the review of the WQCP, which will focus on Delta and Sacramento River flows. This report and analysis was prepared to support Yuba County Water Agency's (YCWA) comments on the SWRCB's notice of scoping of environmental documentation for the WQCP review.

YUBA RIVER UNIMPAIRED AND HISTORICAL FLOW

The Yuba River watershed can be characterized as distinct upper and lower watersheds. Streamflows in the upper watershed are controlled on the Middle and South Yuba Rivers by facilities of Nevada Irrigation District (NID) and Pacific Gas and Electric (PG&E), and on the North Yuba River tributary of Slate Creek by the South Feather Water and Power Agency (SFWP) where it operates a diversion facility. In the lower watershed the Yuba County Water Agency owns and operates New Bullards Bar Dam on the North Yuba River, and the US Army Corps of Engineers owns Englebright Dam on the main-stem Yuba River. YCWA and PG&E both have powerhouses at Englebright Dam that control releases to the 24 miles of the Yuba River from Englebright Dam to the mouth, referred to as the lower Yuba River. **Figure 1** is a map of the Yuba River watershed. Because of the many facilities and diversions in the watershed, especially the complex interconnection of reservoirs and canals in the upper watershed, the unimpaired flow of the Yuba River is not easily quantified, and is a theoretical accounting of the flows at many locations, aggregated to a common point.

Typically the unimpaired flow of the Yuba River is published by DWR on a monthly basis in about the middle of the subsequent month. DWR also publishes a "full natural flow" daily value for the Yuba River at Smartsville on the California Data Exchange Center website about 5 to 10 days after the fact. The "full natural flow" is a preliminary calculation that is not the same as the more precisely calculated monthly values that are published as unimpaired flows. This point becomes important when operation to a theoretical flow calculated in real time, such as unimpaired flow, is contemplated as a flow requirement.

The annual unimpaired flow of the Yuba River has ranged from a low of 370,000 acre-ft in 1977 to a high of 4,925,000 acre-ft in 1982, with a 50 year average (1961 to 2010) of 2,315,000 acre-ft. The upstream projects of SFWP, NID and PG&E divert water from the Yuba River watershed and export it to other watersheds for agricultural and municipal and industrial uses as well as hydropower. YCWA diverts water from the lower Yuba River for agricultural use within Yuba County. YCWA and PG&E divert water for hydropower in the lower watershed, but water from these diversions is immediately returned to the Yuba River.

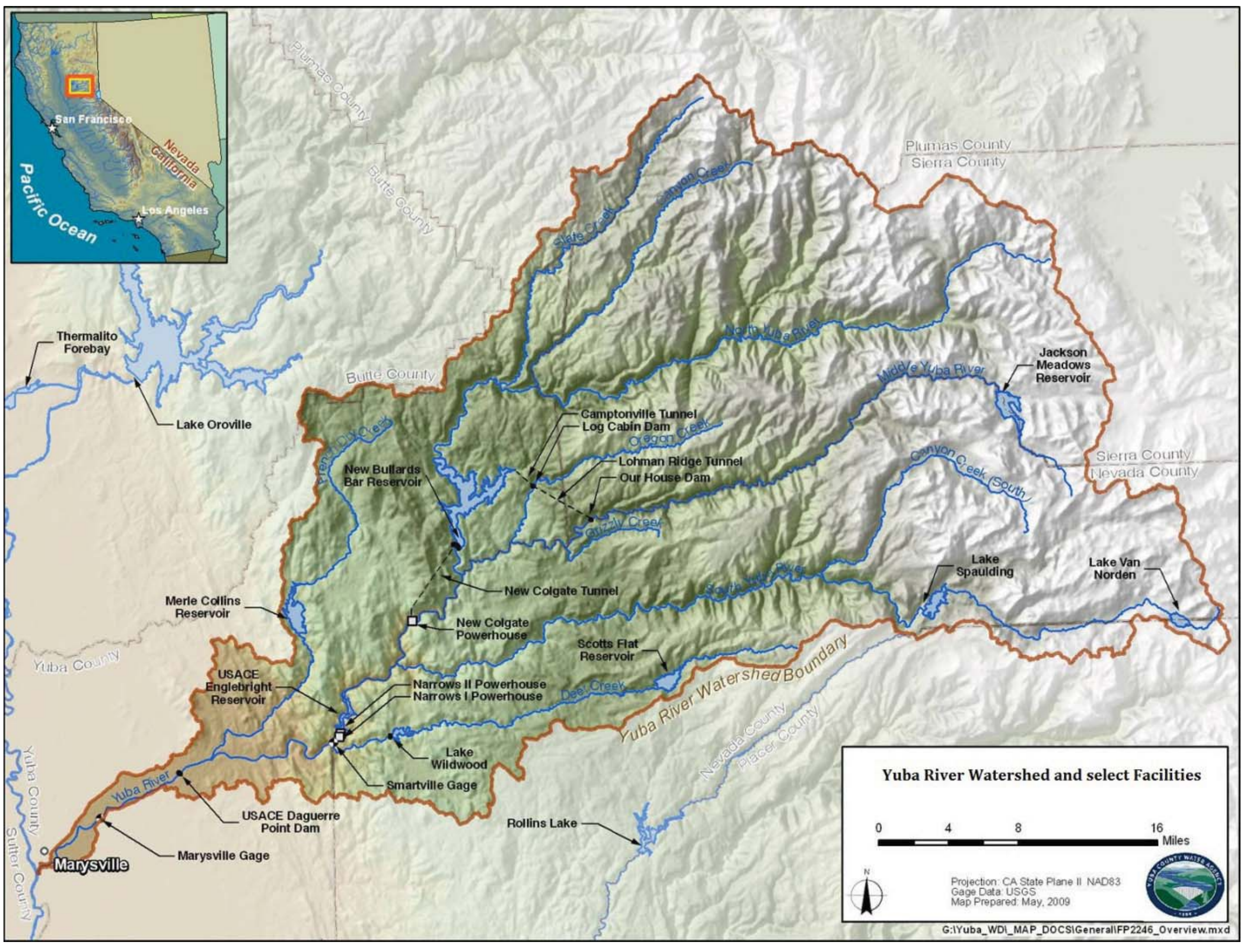


Figure 1: Map of the Yuba River Watershed and Major Facilities

The Yuba River natural flow is affected by upstream diversions out of the watershed, in-basin consumptive uses and reservoir operations for storage, flood control, hydropower and instream flows. The lower Yuba River flow regime has been more recently altered with the implementation of the lower Yuba River Accord in 2008. Because historical flow data does not fully represent current operations for instream beneficial uses on the lower Yuba River, modeling results provide the best characterization of Yuba River outflow under current requirements and historical hydrology. A daily time-step model, which will be used in the on-going Yuba River Development Project (YRDP) FERC relicensing, was used in the analysis for this report to simulate operations of the YRDP for the various controlling criteria, including the Yuba Accord flow schedules. For this report, unless otherwise noted, all modeling data was generated using this preliminary version of the YRDP relicensing model.

To quantify the existing condition Yuba River outflow as a percentage of unimpaired flow, the historical hydrologic period of 1976 through 2004 was used to model the YRDP operations, and historical flows were used for the upstream project operations. **Figure 2** is a plot of monthly average Yuba River outflow as a percentage of unimpaired flow averaged for all years and averaged for Dry and Critical years using the D-1644 Yuba River Index year types. The average annual Yuba River Outflow as a percentage of unimpaired flow is 64% and the percentage for January through June is 59%. For Dry and Critical years, the average annual outflow is 46% of unimpaired flow and for January through June of Dry and Critical years the percentage is 36%.

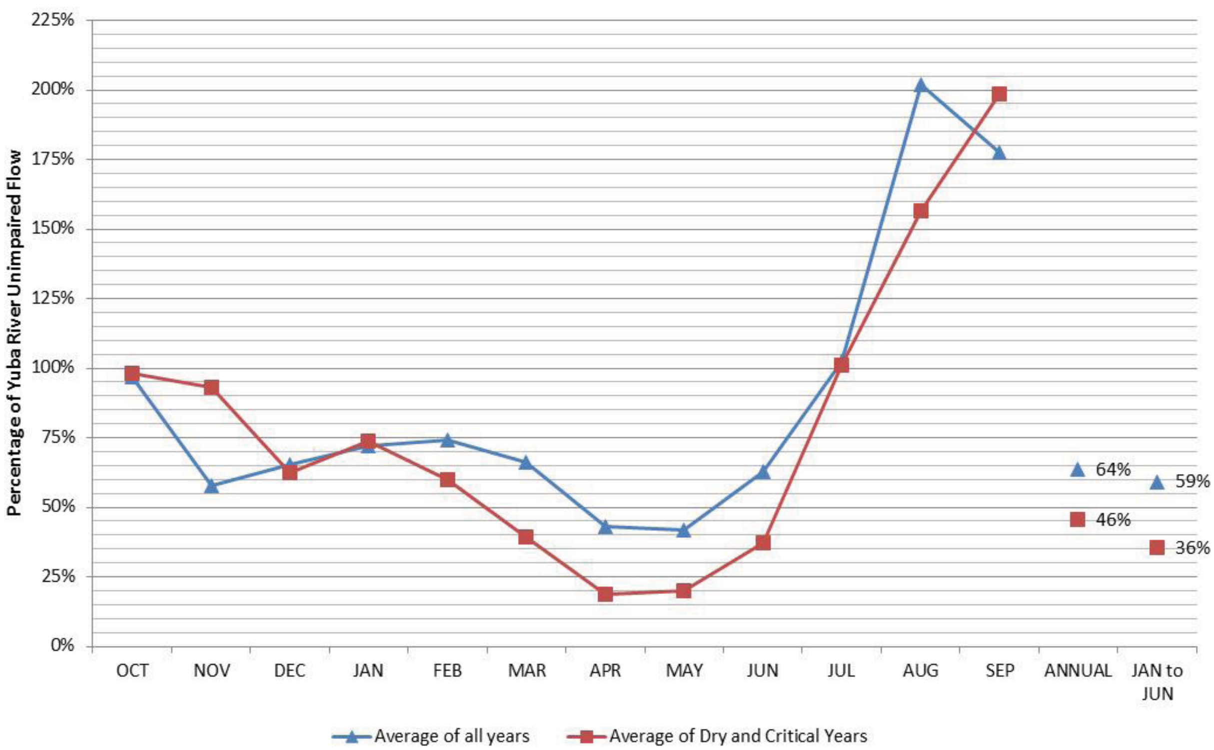


Figure 2: Average Existing Condition Yuba River Outflow as a Percentage of Unimpaired Flow

Figure 2 shows that Yuba River outflows generally are nearly the same as unimpaired flows in the fall, somewhat less than unimpaired flows in the winter, significantly less than unimpaired flows in the spring and significantly greater than unimpaired flows in the summer. The effects of the various projects in the watershed on Yuba River outflows are fundamentally different. The upper watershed projects store and divert some water in the winter, but primarily store and divert water during the spring snowmelt season. In the summer and fall, these projects release flows at or slightly above the unimpaired flow rates. However, at these upper watershed locations the unimpaired flows during these months are small percentages of the total annual watershed unimpaired flow. The YRDP also stores significant amounts of water in the spring and some water in the winter in New Bullards Bar Reservoir, but this project releases flows at rates greater than the unimpaired inflow rates at times in the winter and at rates that are significantly greater than the unimpaired flow rates in the summer and early fall. When examined in the context of the amounts of water that the YRDP has available for flow releases, i.e. the amounts of inflow to New Bullards Bar Reservoir, the minimum instream flow requirements for the lower Yuba River are quite large and constitute a high percentage of the natural and diverted inflow into the reservoir. **Figure 3** is a plot of the annual volumes of water that would have been required by the lower Yuba Accord flow schedules for flows at the Marysville Gage, over the 1976-2004 period of record. The Marysville Gage is essentially a Yuba River outflow requirement, and these flows are calculated as percentages of inflows to New Bullards Bar Reservoir, including the diversions to the reservoir from the Middle Yuba River and Oregon Creek. This figure shows that the flows required to implement the Yuba Accord almost equal the total inflow into the reservoir in most dry and critical years.

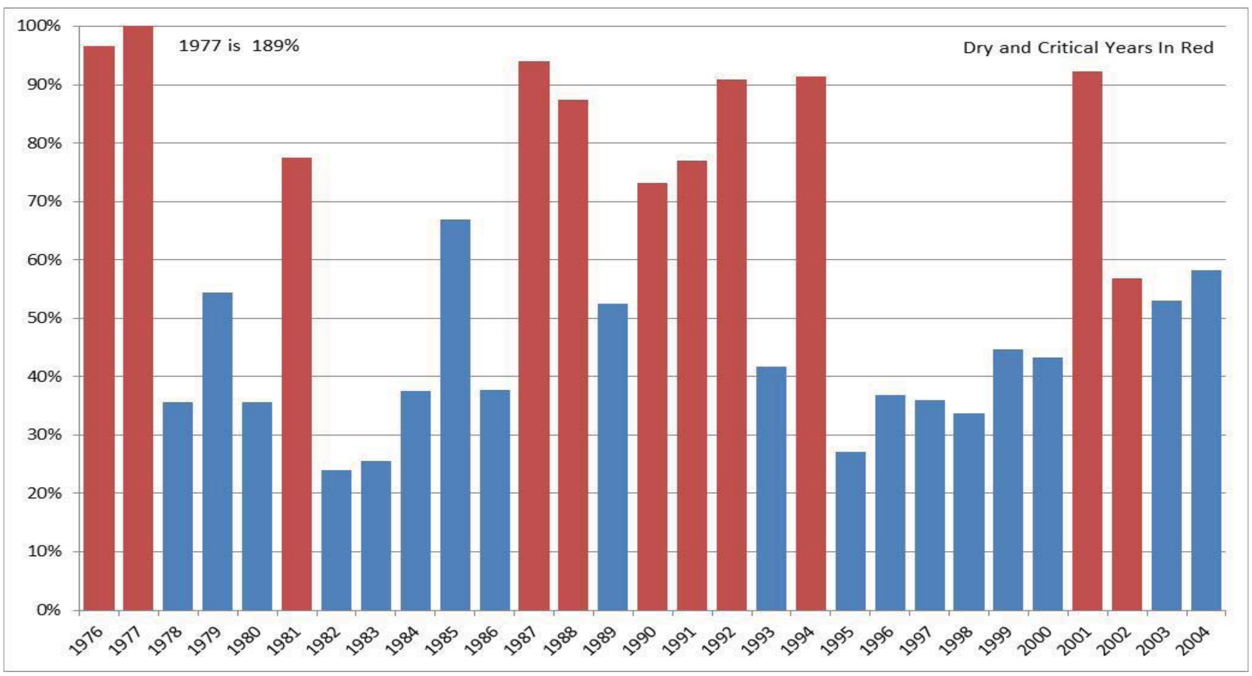


Figure 3: Annual Yuba Accord Instream Flow Volume as a Percentage of New Bullards Bar Reservoir Annual Inflow (including diversions from the Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir)

MODELING ASSUMPTIONS

The 2010 SWRCB Delta Flow Criteria Report identified 75% of Sacramento River Inflow as a Category A criterion. Category A criterion are described in the SWRCB report as "*supported by more robust scientific information*". The report also stated that "*Inflows should generally be provided from tributaries to the Delta watershed in proportion to their contribution to unimpaired flow unless otherwise indicated.*" A previous analysis by YCWA to examine the effects of the SWRCB Delta Flow Criteria on the Yuba River focused on a Yuba River outflow requirement that would have been based on 75% of unimpaired flow. The results of that analysis showed that the impacts of implementing such a requirement on all beneficial uses of water would be so severe that it is very unlikely that the SWRCB would adopt a criterion based on that percentage. For the San Joaquin River flow objectives, the SWRCB has examined a range of 20% to 60% of unimpaired flow. For this analysis, the 40% and 50% levels of unimpaired flows were examined. As shown later in this report, even at these levels the impacts to beneficial uses of water in the Yuba River watershed would be very large.

This discussion of analysis results presents three simulation scenarios: a baseline condition, which is the existing condition, a 40 percent of unimpaired flow scenario (40 percent scenario) and a 50 percent of unimpaired flow scenario (50 percent scenario). In all scenarios the YRDP is simulated to operate to meet all YRDP FERC license terms, the lower Yuba Accord minimum instream flow requirements and the various ramping rate and flow fluctuation requirements in the YRDP FERC license. Additional operational constraints include flood control manual operations and prudent water management operations. Water years 1976 through 2004 are in the simulation period of record.

The method of analysis used to model the 40 percent and 50 percent of unimpaired flow Yuba River outflow criteria was to apply each of these criteria as an additional minimum instream flow requirement at the Marysville Gage, which is located 5.6 miles upstream of the Yuba/Feather River confluence, for the period of January through June. These criteria and the Yuba River Accord flow criteria both are applied at that location, such that whichever flow criterion was greater on a particular day would govern the modeled operations for that day. The preliminary daily time-step YRDP relicensing model (YRDP Model) includes all operating criteria that would potentially result in requiring releases of water from the YRDP facilities and Englebright Dam as well as logic to determine storage objectives. The only criteria not implemented in the model are FERC license hourly ramping rates, and the hourly operations criteria for flood control specified in the Corps of Engineers Flood Control Manual for New Bullards Bar Dam and Reservoir. The model does simulate flood control releases at a daily time step to account for water releases needed to evacuate the reservoir's flood pool.

For this modeling work, it is assumed that the daily unimpaired flow for the Yuba River would be known each day on a real-time basis, and the model sets the Yuba River outflow required as the specified percentage (either 40 percent or 50 percent) of the unimpaired flow for that day. The model assumes that the YRDP would be responsible for implementing these flow criteria at the Marysville Gage, and that all other projects in the watershed would continue to make their historical releases. The basis for this assumption is the SWRCB's previous determination to not require any releases from the upstream projects to help implement the lower Yuba River minimum instream flow requirements established in 2003 in SWRCB Revised Decision 1644 (“RD-1644”). RD-1644 states (page 150);

> *“The fact that there are water diversions from upper reaches of the Yuba River under earlier priority rights does not prevent the SWRCB from determining appropriate conditions to be included in YCWA's water right permits for protection of public trust resources in the lower Yuba River. The SWRCB was not required to conduct a statutory adjudication of all rights within the watershed when it initially established the instream flow requirements in YCWA's permits, nor is it required to adjudicate all water rights within the basin in order to revise those requirements. In the case of those projects that divert water from the upper Yuba River solely for production of hydropower under a license from FERC, the SWRCB's jurisdiction to independently establish instream flow requirements as a condition of a water right permit has been preempted by federal law.”*

Therefore it is reasonable to assume that the SWRCB would not impose any of the burdens of implementing new Yuba River outflow criteria on the upstream projects, and thus that the YRDP would be solely responsible for implementing these criteria.

Two other assumptions were made for the simulation of the flow criteria. First, for this analysis, it is assumed that the flow criteria would be applied on a daily basis. Thus, the model assumes that, if on a given day the YRDP cannot meet the flow criterion because of YRDP release capacity constraints, then the criterion would be violated, but the YRDP would not have to make subsequent releases on a later day to “make up” for the violation. Because the YRDP does not have the release capacity to implement a 50 percent, or even a 40 percent of unimpaired flow Yuba River outflow requirement on many days, the criteria would be violated on average 4 days per year for the 40% scenario and on average 9 days per year for the 50 percent scenario. For most of these daily violations, a 14 day running average also would be violated.

The SWRCB Delta Flow Criteria report indicated that the criterion should be implemented as a 14 day running average. Therefore, for this modeling work a sensitivity analysis was run to see what differences might occur between the modeled scenarios with a daily standard, and with a 14 day running average. Although these difference could not be precisely modeled because of model limitations, the model results indicate that a 14 day running average would result in even more water being released from New Bullards Bar Reservoir to meet the Yuba River outflow criteria, because there would be more opportunities to meet those criteria, and therefore the impacts of implementing those criteria would be even greater than the impacts presented in this report.

The second assumption related to daily Yuba River outflow criteria and YRDP release capacity constraints concerns the operation of irrigation diversions. On days when the sum of the flow criteria and the irrigation diversion demand would be greater than the powerhouse release capacity, which would happen in the spring on many days in almost all years, the model assumes that the irrigation diversion would be shorted first, until the Yuba River outflow criterion was met or all diversions had ceased. Then, if necessary, the model assumes that the flow criterion would not be met. Examination of the 14 day average sensitivity analysis shows that, even using a 14 day average for the Yuba River outflow criteria, the YRDP still would not always have enough release capacity to implement the flow criteria and also to supply full irrigation diversion demands.

Analysis Results and Conclusions

Imposing a Yuba River outflow requirement of 40 or 50 percent of unimpaired flow from January through June would significantly affect all beneficial uses of water in the lower Yuba River, as well as downstream of the Yuba River. Instream flows and temperatures targeted to benefit listed fish species, water supplies for agriculture in Yuba County and water supplies for other areas of the State, power generation, recreation and groundwater basin sustainability all would be negatively impacted by such an outflow requirement. For the 40 percent and 50 percent scenarios, the intended benefits of increased January through June inflows to the Delta from the Yuba River actually would be limited to the months of April and May, and the criteria actually would result in lower flows during some times in January and February and slight increases during some times and slight decreases during other times in March and June. For the July through September period, flows on the lower Yuba River would be significantly reduced in a number of years and the greatest reductions would occur in some of the driest years.

Yuba River Outflows

To model with the increased Yuba River outflows that would be required in the spring under the 40 and 50 percent of unimpaired flow criteria, the model assumes that these additional water demands would be provided by a combination of shortages in irrigation deliveries, reduced instream flows during other times of the year and storage releases, which would reduce the following year's outflows. **Figure 4** is a plot of the change in average annual Yuba River outflow by Year Type (D-1644 Yuba River Index) from baseline conditions to the 40 and 50 percent scenarios. The figure shows that annual outflow volumes in Dry and Critical years are higher than under baseline conditions, but outflow volumes in Wet and Above Normal years are somewhat lower.

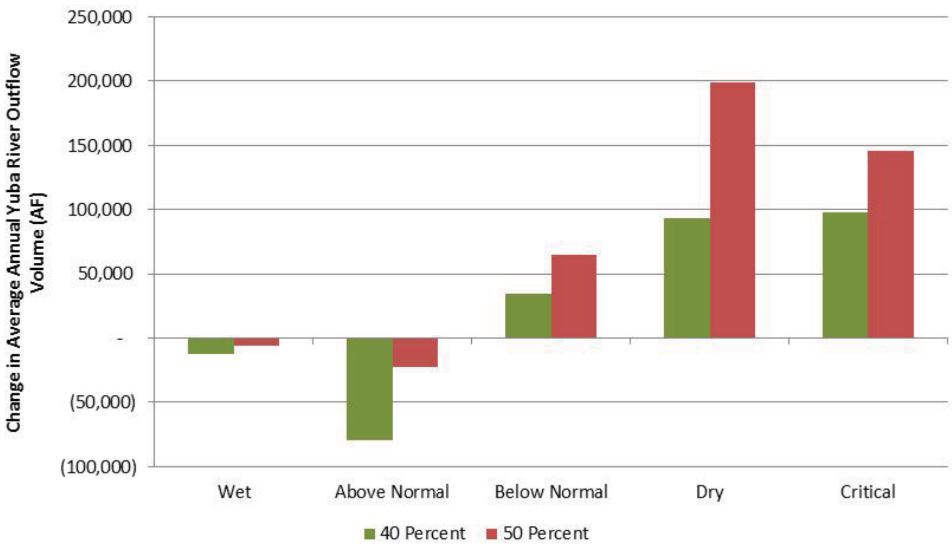


Figure 4: Change in Annual Yuba River Outflow Volume by Year Type for 40 and 50 Percent Scenarios

The 40 and 50 percent of unimpaired flow criteria would change the timing and magnitude of Yuba River outflows during other times of the year, generally reducing outflows outside the January through June period when the flow criteria would apply. This shift would be more pronounced in the drier years. **Figures 5 and 6** show the percent changes in average monthly Yuba River outflows by water year type for the 40 percent and 50 percent scenarios, each compared to baseline conditions.

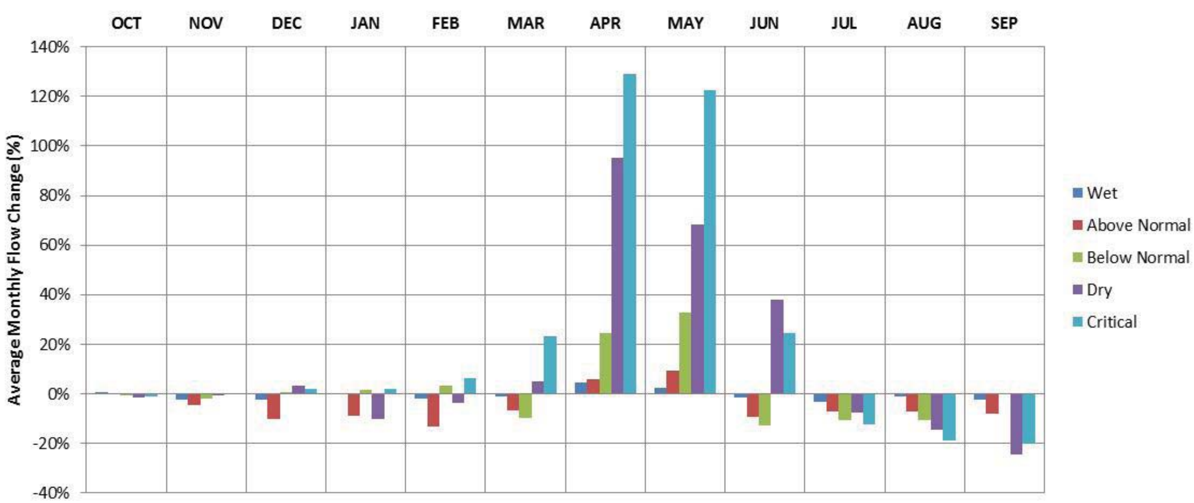


Figure 5: Change in Average Monthly Yuba River Outflow by Year Type for the 40 percent Unimpaired Flow Scenario as a percentage of Baseline flows

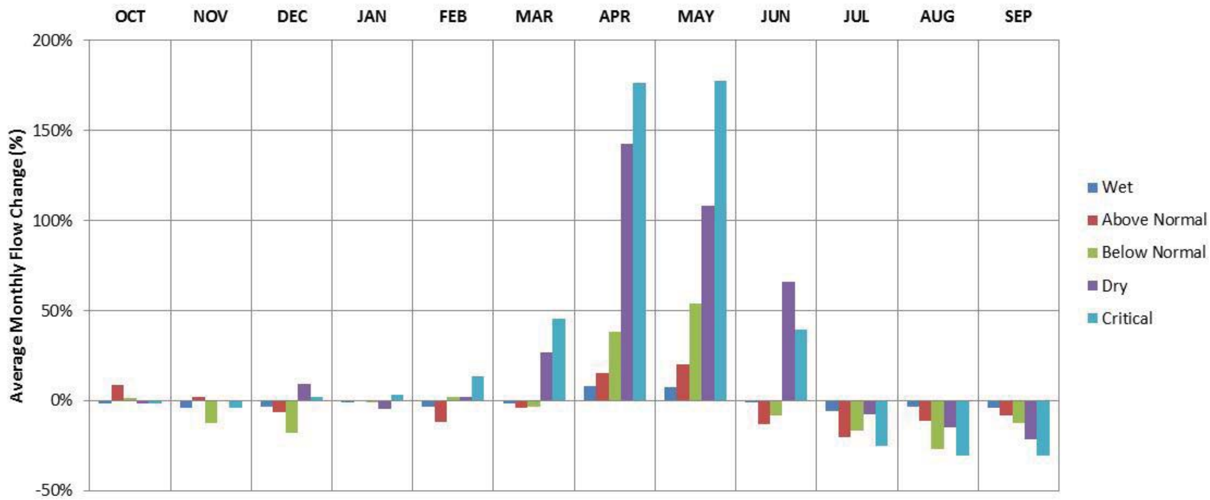


Figure 6: Change in Average Monthly Yuba River Outflow by Year Type for the 50 percent Unimpaired Flow Scenario as a percentage of Baseline flows

This report also shows the comparative differences in lower Yuba River flows for the 40 percent and 50 percent scenarios relative to the baseline condition through exceedance probability curves. Appendices A and B contain flow exceedance probability curves for the 29-year period of evaluation for the 40 percent and 50 percent scenarios respectively, with each scenario being compared to baseline conditions. There is a separate figure for each month, and for each of two locations: the Smartsville Gage, which is located below Englebright Dam and is representative of the upper 12 miles of the lower Yuba River, and the Marysville Gage, which is located 5.6 miles upstream from the mouth of the lower Yuba River and is representative of the lower 11.5 miles of the lower Yuba River. Flows in the upper and lower reaches of the lower Yuba River differ in the spring, summer and fall due to the diversion of irrigation water at Daguerre Point Dam at river mile 11.6.

An alternate method of presenting flow changes from baseline conditions to the two flow criteria scenarios is provided in **Figures 7, 8, 9 and 10.** These figures show the changes in average monthly flows by water year type at the Smartsville Gage and the Marysville Gage from baseline conditions to the 40 and 50 percent unimpaired flow scenarios. These figures reflect the conclusions stated above, namely that, under the 40 percent and 50 percent scenarios, increased flows in the spring would be provided at the expense of wetter year winter flows, summer instream and irrigation flows and fall instream and irrigation flows. The effects of significantly reduced irrigation deliveries on the lower Yuba River flows above Daguerre Point Dam can be seen in the Figures 7 and 9 for Smartsville flow changes from baseline conditions to the 40 percent and 50 percent scenarios.

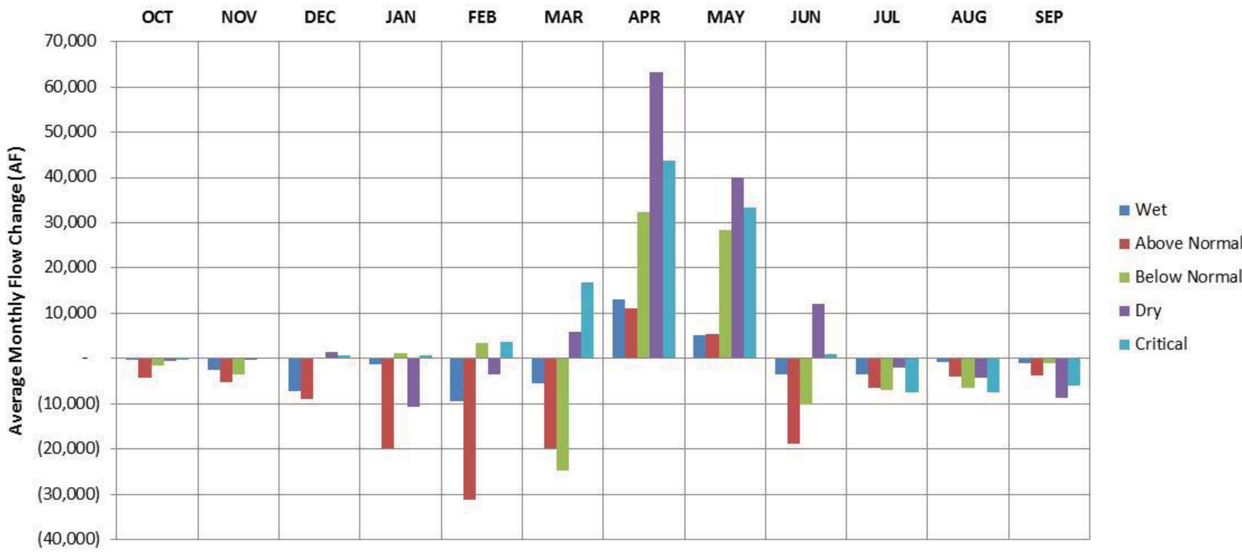


Figure 7: Average Monthly Flow Change (AF) at Smartsville Gage from Baseline Conditions for the 40 Percent Unimpaired Flow Scenario by Year Type

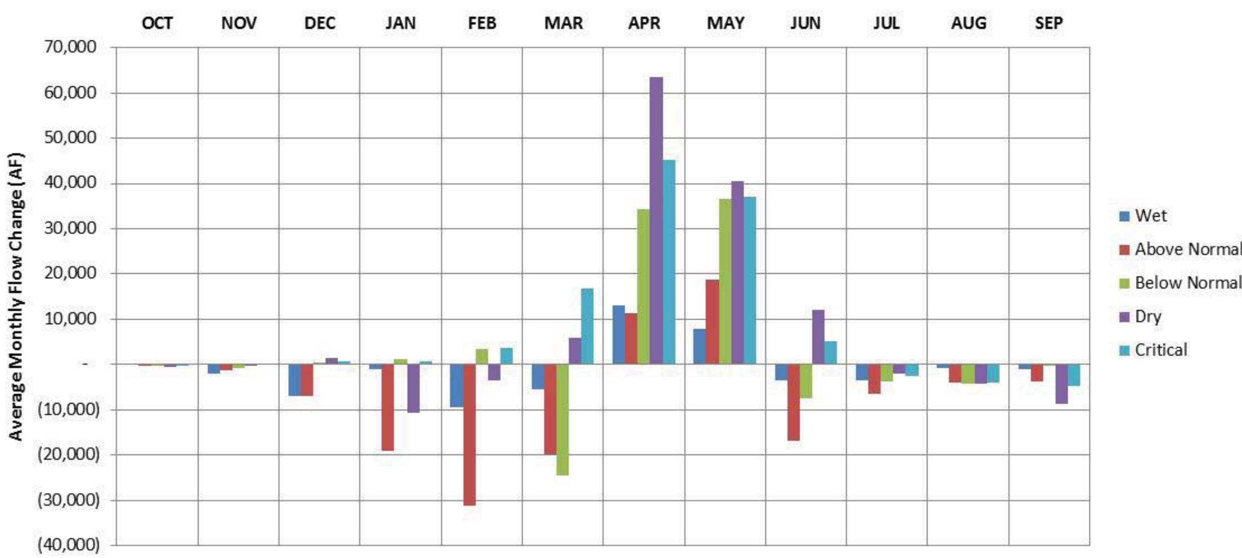


Figure 8: Average Monthly Flow Change (AF) at Marysville Gage from Baseline Conditions for the 40 Percent Unimpaired Flow Scenario by Year Type

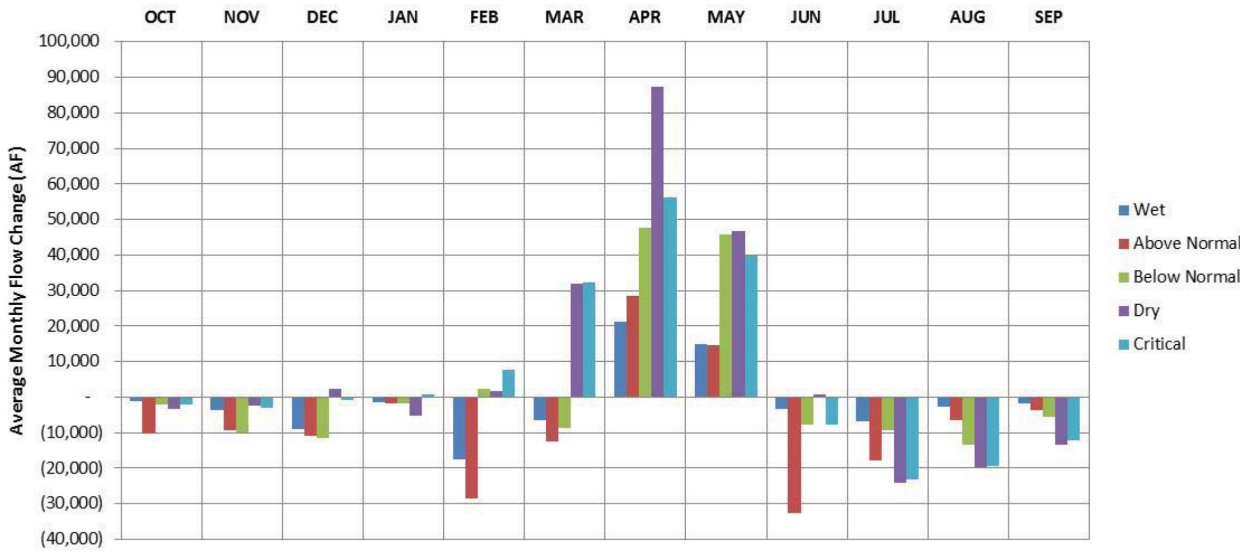


Figure 9: Average Monthly Flow Change (AF) at Smartsville Gage from Baseline Conditions for the 50 Percent Unimpaired Flow Scenario by Year Type

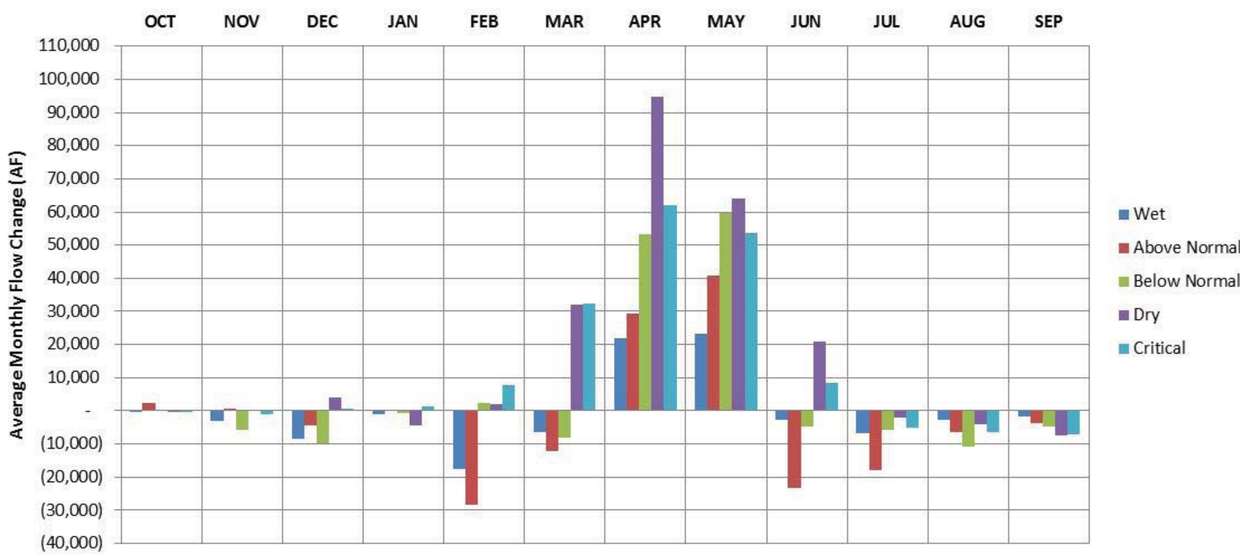


Figure 10: Average Monthly Flow Change (AF) at Marysville Gage from Baseline Conditions for the 50 Percent Unimpaired Flow Scenario by Year Type

New Bullards Bar Reservoir Storage Yuba Accord Flow Schedules and Resulting Flows

The primary governing flow requirements for on the lower Yuba River are in the Yuba Accord minimum instream flow schedules. The Yuba Accord contains six numbered instream flow schedules plus provisions for a seventh year type, called a "conference year." See http://www.ycwa.com/projects/detail/8 for more information on the Yuba Accord. The Yuba Accord flow schedule that is applicable during any particular year is determined by the North Yuba Index, which is an index of available water for the lower Yuba River for the current water year, based on the amount of active storage in New Bullards Bar Reservoir at the start of the water year, plus measured reservoir inflow to date, plus forecasted reservoir inflow for the remainder of the water year. Inflow to New Bullards Bar Reservoir is affected by hydrology, and does not change because of downstream operational requirements. The amount of water stored in New Bullards Bar Reservoir at the beginning of each water year is significantly affected by previous year's downstream demands, including irrigation deliveries and the applicable Yuba Accord flow schedule. In drier years, the amount of water in active storage in New Bullards Bar Reservoir is a significant percentage of the amount of the North Yuba Index, and flow requirements for the previous year can affect the index and thus the Accord flow schedule that will apply during the next year.

Figures 11 and 12 contain plots of New Bullards Bar Reservoir storage under the baseline condition and the 40 and 50 percent scenarios, respectively, for the model simulation period from water year 1976 through water year 2004. New Bullards Bar Reservoir has a normal maximum capacity of 966,103 acre-feet and a FERC-required minimum pool of 234,000 acre-feet, resulting in 732,103 acre-feet of active storage capacity. Dry and Critical years are shaded in gray to highlight these years in the figures. As shown on Figure 11, New Bullards Bar Reservoir would be drawn down to minimum pool on three occasions, and almost on a fourth occasion, under the 40 percent scenario, while under baseline conditions storage would be depleted to minimum pool only in 1977. During times when reservoir storage is depleted, the YRDP does not have any ability to augment the very low runoff normally present under such conditions with releases from New Bullards Bar Reservoir storage. As seen in Figure 12, New Bullards Bar Reservoir would be drawn down to minimum pool on five occasions, and almost on a sixth occasion, under the 50 percent scenario.

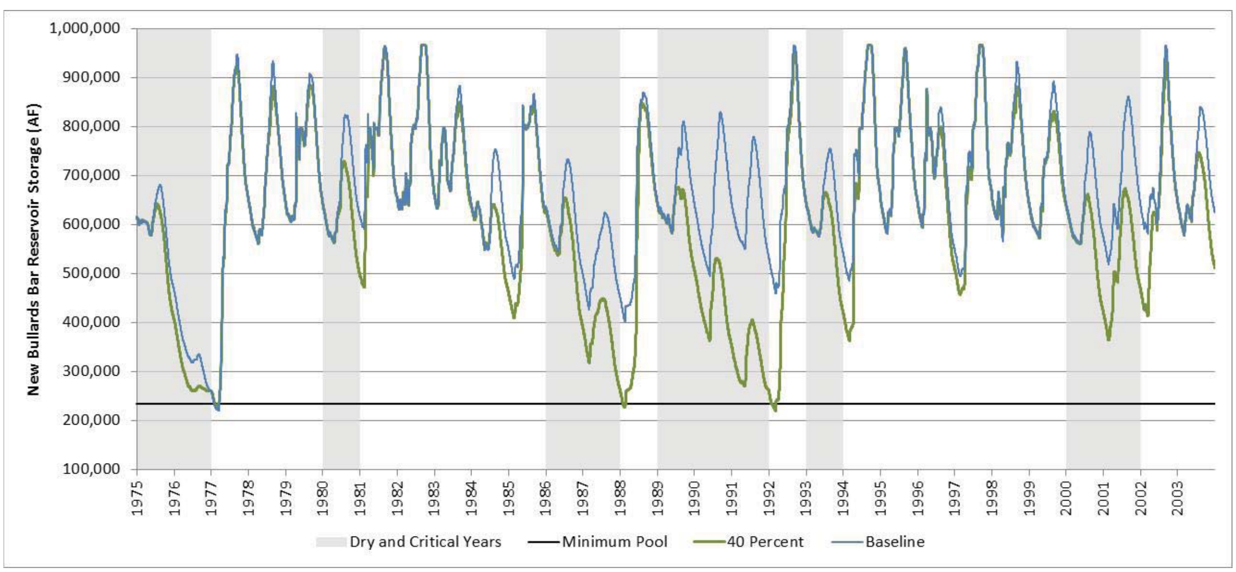


Figure 11: New Bullards Bar Reservoir Storage for the 40 Percent Unimpaired Flow Scenario Compared with Baseline Conditions

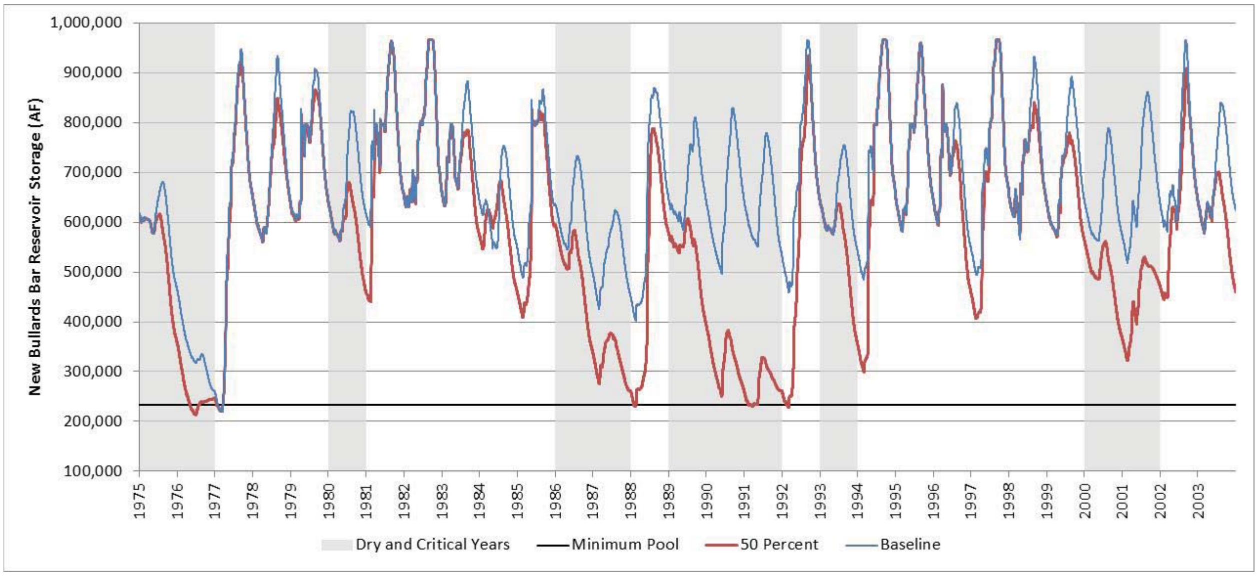


Figure 12: New Bullards Bar Reservoir Storage for the 50 Percent Unimpaired Flow Scenario Compared with Baseline Conditions

When end-of-September storage in New Bullards Bar Reservoir changes, the North Yuba River Index also changes. If the index change is great enough to cross the threshold value for one of the Yuba Accord flow schedules, then the following year's Yuba Accord flow schedule will also change. **Figure 13** is a plot of modeled New Bullards Bar Reservoir storage at the start of the water year (September 30th end of day storage), plotted by exceedance probabilities, for the baseline condition, the 40 percent scenario and the 50 percent scenario.

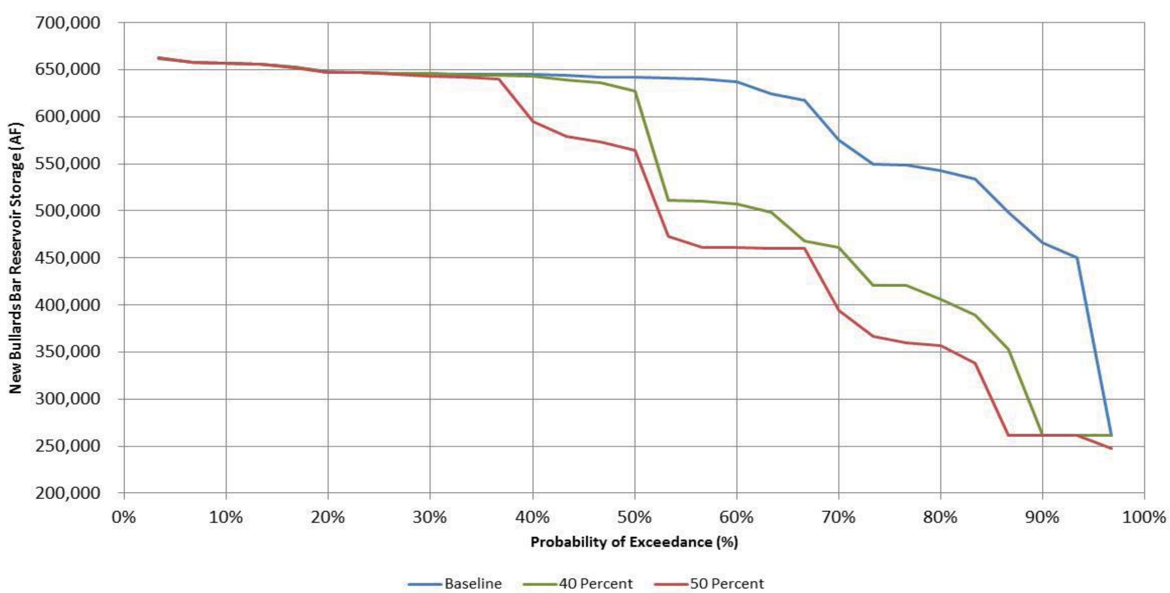


Figure 13: Probability of Exceedance of New Bullards Bar Reservoir Water Year Starting Storage for the Baseline Condition, 40 Percent Unimpaired Flow and 50 % Unimpaired Flow Scenarios

For the 40 percent scenario, starting year storage in New Bullards Bar Reservoir would be more than 100,000 acre-ft lower than under the baseline condition at the 70 percent exceedance probability, and would be about 200,000 acre-ft lower than under the baseline condition at the 90 percent exceedance probability. At this 90% exceedance probability, starting year New Bullards Bar Reservoir storage would be at the minimum pool level.

For the 50 percent scenario, starting year storage in New Bullards Bar Reservoir would be more than 160,000 acre-ft lower than under baseline conditions at the 70 percent exceedance probability, and would be about 200,000 acre-ft lower than under baseline conditions at the 87 percent exceedance probability. At this 87% exceedance probability, this storage level would be at the minimum pool level.

The impacts on New Bullards Bar Reservoir starting water year storage have direct impacts on the applicable Yuba Accord flow schedules and the resulting flows in the Lower Yuba River. **Figure 14** depicts the Yuba Accord flow schedules for each year of the simulation of the baseline condition and 40 percent scenario. Yuba Accord flow Schedule 1 has the highest minimum instream flow requirements and Schedule 7, which represents Conference Years, has the lowest requirements. For the Yuba Accord, Conference Years are expected to occur on average only once per hundred years, that is, at a 1% probability of occurrence. Yuba Accord Conference Year requirements were established to address the very rare expected occurrences of very little available water.

As shown in Figure 14, implementation of the 40 percent of unimpaired flow criteria would shift the occurrence of flow schedules, with higher frequencies of occurrence of flow schedules with lower instream flow requirements relative to the baseline condition (that is higher numbered flow schedules). With implementation of 40 percent of unimpaired flow criteria, there would be 7 years in the 29-year simulation (a 24 percent occurrence) during which the applicable Yuba Accord flow schedule would be a higher number than under baseline conditions (that is, there would be lower required minimum flows in the lower Yuba River under this scenario than under baseline conditions). In one of those years (1992), the applicable Yuba Accord instream flow schedule would change from Schedule 5 to a Conference Year. The significance of this shift is demonstrated by the relative annual flow volumes for the Marysville Gage in the lower Yuba River. Under Schedule 5, this amount is 334,818 acre-feet, whereas under a Conference Year this amount is 173,722 acre-feet, which is about half of the Schedule 5 volume.

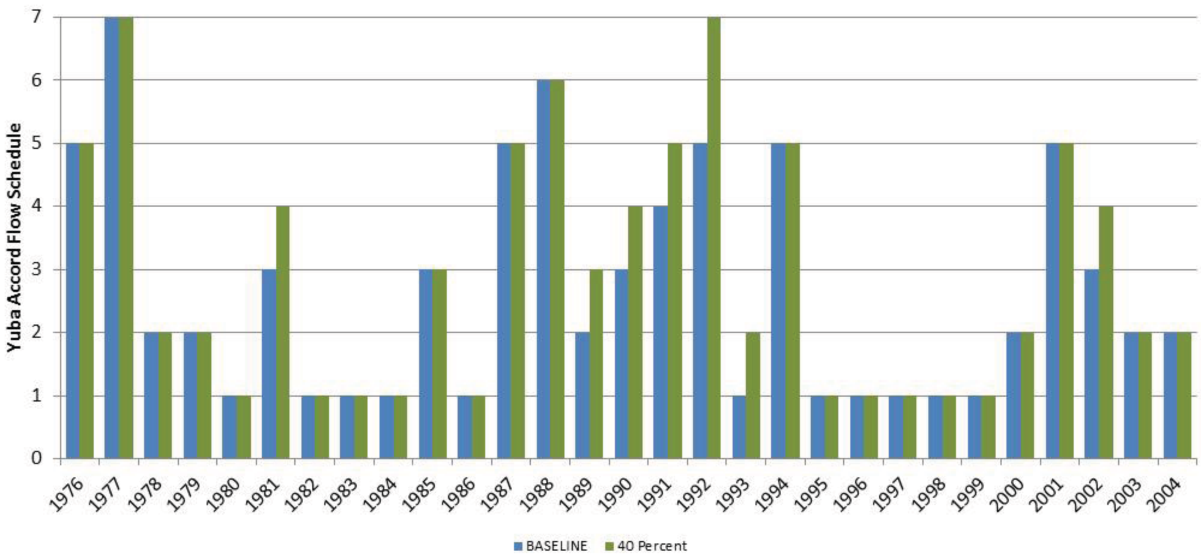


Figure 14: Yuba Accord Flow Schedules for the Baseline Condition and 40 Percent Unimpaired Flow Scenario

Figure 15 depicts the Yuba Accord flow schedules for each year of the simulation under the baseline condition and under the 50 percent scenario. As shown in Figure 15, implementation of the 50 percent of unimpaired flow criteria would shift the occurrence of Yuba Accord flow schedules, with a higher frequency of occurrence of higher numbered flow schedules (flow schedules with lower instream flow requirements) relative to the baseline condition. With implementation of the 50 percent of unimpaired flow criteria, there would be 9 years in the 29-year simulation (or about a 31 percent occurrence) during which the applicable Yuba Accord flow schedule would be a higher number than under baseline conditions (that is, there would be lower required minimum flows in the lower Yuba River). In two years the applicable Yuba Accord flow schedule would shift to a Conference Year from Schedule 6 (in 1988) and from Schedule 5 (in 1992).

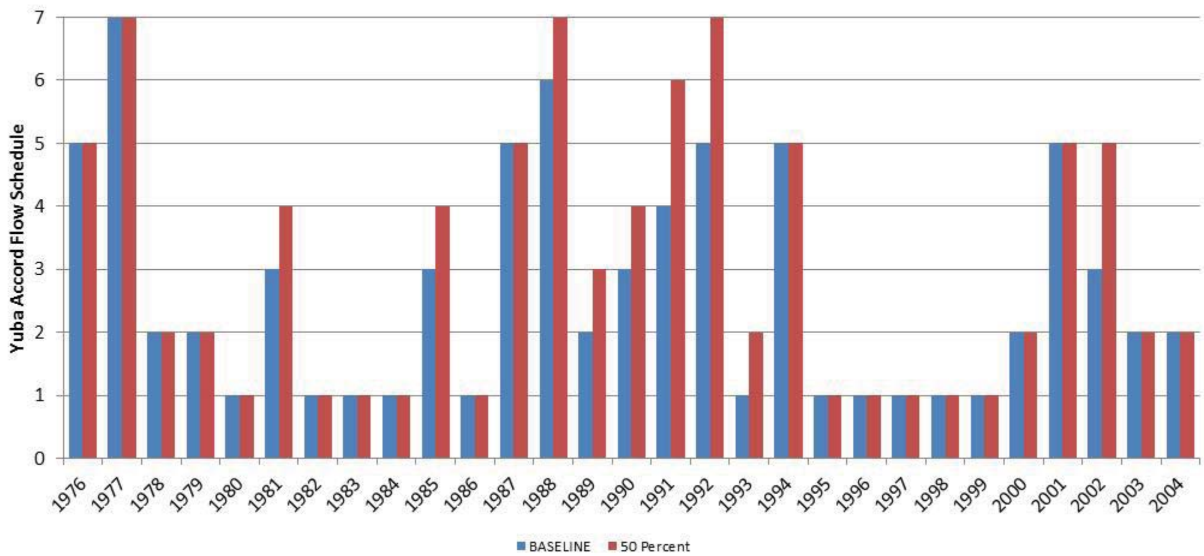


Figure 15: Yuba Accord Flow Schedules for the Baseline Condition and 50 Percent Unimpaired Flow Scenario

The shifts to Conference Years, along with depleted storage in New Bullards Bar Reservoir and substantially curtailed irrigation diversion releases, would have very significant impacts on the flow and temperature conditions of the lower Yuba River. An example of the magnitude of impacts on flows is shown in **Figure 16**. Figure 16 is a plot of the modeled mean daily flow in the upper reach of the lower Yuba River, where spring run salmon hold through the summer and spawn in the late summer and early fall. Modeled flows for both the baseline condition and 50 percent scenario are plotted in this figure. For the 50 percent scenario, flows would be below 500 cfs all summer and would range from 140 to 250 cfs in September, while under baseline conditions the flow would never be below 500 cfs. Under the 50 percent scenario, New Bullards Bar Reservoir storage would be about 260,000 acre-ft in September and thus would be nearly depleted. This would result in the release of warm water. Historically, since New Bullards Bar Reservoir was constructed in 1969, lower Yuba River flows have only been this low once, in 1977. Under the 50 percent scenario, flows in the lower reaches of the Yuba River below Daguerre Point Dam in the summer of 1992 would be about 70 cfs. These low summer flows, combined with a depleted cold water pool in New Bullards Bar Reservoir, would result in higher reservoir release temperatures and very high water temperatures throughout the lower Yuba River.

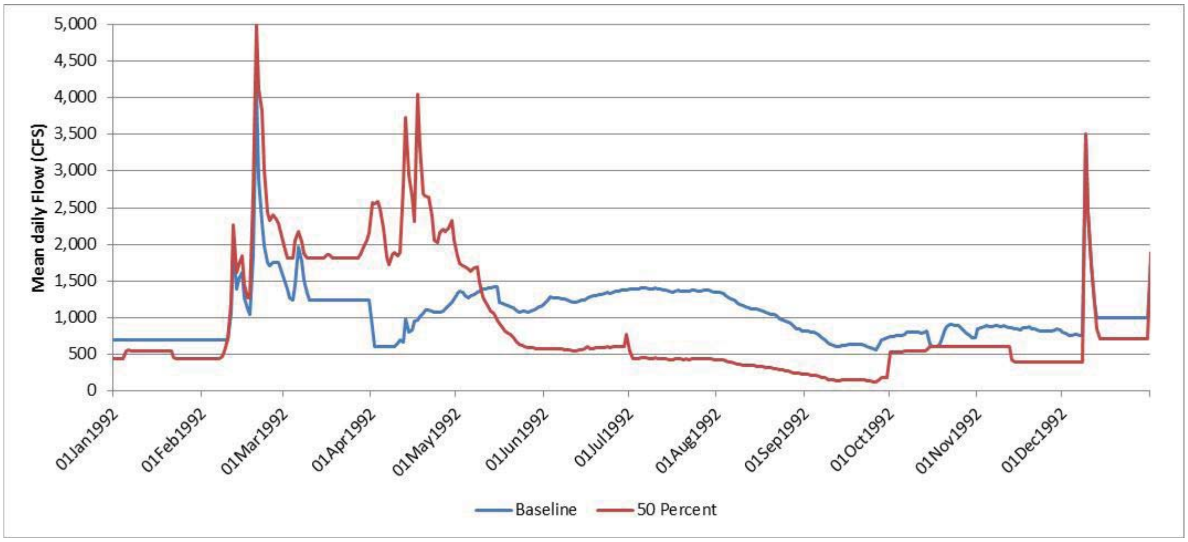


Figure 16: Mean Daily Flow at Smartsville Gage during 1992 for the Baseline Condition and 50 Percent Unimpaired Flow Scenario

WATER TEMPERATURES

Implementation of the 40 or 50 percent of unimpaired outflow criteria would result in higher release temperatures from New Bullards Bar Reservoir through the Colgate Powerhouse, relative to the baseline condition, and these higher release temperatures would result in higher water temperatures in the lower Yuba River. Increases of more than 2°F in release temperatures from New Bullards Bar Reservoir through the Colgate Powerhouse would occur during summer and fall in 4 of the 29 years evaluated, for the 40 percent of unimpaired flow scenario and in 10 of the 29 years for the 50 percent of unimpaired flow scenario, relative to the baseline condition. **Figure 17** is a plot of the modeled mean daily release water temperatures from Colgate Powerhouse for the baseline condition and the 40 percent scenario, and **Figure 18** is a plot of the modeled mean daily release temperatures for the baseline condition and the 50 percent scenario.

Figures 17 and 18 show that, for certain years, like 1976-1977 and 1988-1992, differences in modeled Colgate Powerhouse release water temperatures between the 40 percent and 50 percent scenarios and the baseline condition would be extreme. For example, for the summers and falls of 1988 and 1992, the model indicates that increases in Colgate Powerhouse release temperatures would be as much as 6 and 8°F, respectively, under the 40 percent scenario, and about 10 and 13°F for the 50 percent scenario for these two time periods. Under the baseline condition, the modeled Colgate Powerhouse release temperature exceeds 52°F on only one day each in 1988 and 1992. In contrast, the 40 percent and 50 percent scenarios model results indicate that much higher daily average water temperatures would occur over extended time periods. For the 40 percent scenario, release temperatures would exceed 56°F during most of August through November during 1988, and would exceed 56°F from late August through October during 1992. For the 50 percent scenario, release temperatures would exceed 58°F during mid-

July through September in 1988, and would exceed 58°F from late June through mid-September, and 62 degrees for a week in July, in 1992.

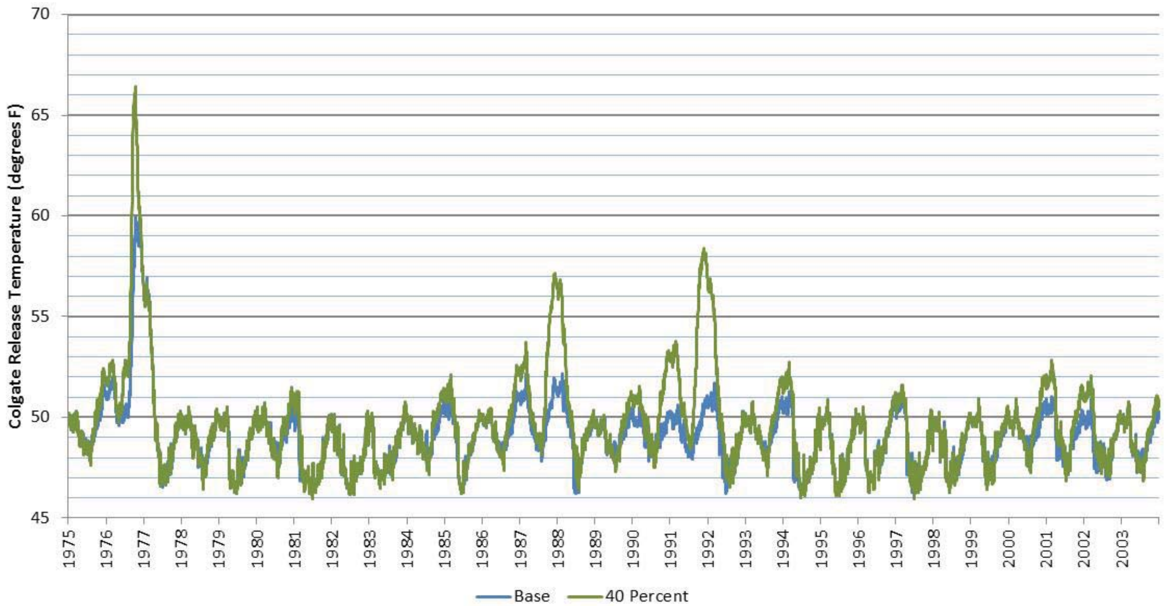


Figure 17: New Colgate Powerhouse Release Water Temperatures for the Baseline and 40 Percent Scenarios

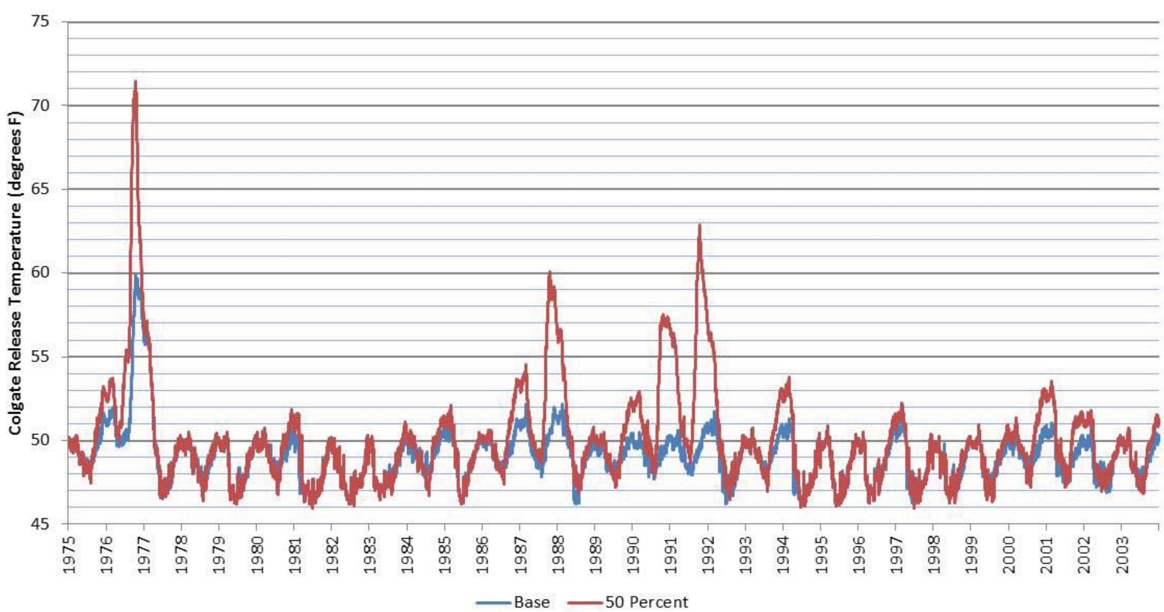


Figure 18: New Colgate Powerhouse Release Water Temperatures for the Baseline and 50 Percent Scenarios

WATER SUPPLY

Agricultural irrigation deliveries are made at Daguerre Point Dam to the eight Member Units to which YCWA supplies water. The 40 percent and 50 percent of unimpaired flow criteria would have very large impacts on the availability of water for YCWA's irrigation deliveries. Historically, irrigation water supplies from the Yuba River for local needs have been reliable, primarily due to the low percentage of irrigation demand volume to the total average Yuba River runoff volume. The available runoff volume is the amount of water available to the lower Yuba River after upstream diversions and lower Yuba River instream flows. The present annual irrigation diversion demand is about 305,000 acre-feet while the average annual runoff available to the lower Yuba River before allocations for instream flow is about 1,830,000 acre-feet. The average annual flow requirement at Marysville Gage for the Yuba Accord is 443,000 acre-feet, so the average annual volume of runoff available for irrigation deliveries is 1,387,000 acre-feet. Because most of this runoff occurs in the winter and spring, only a portion of this volume can be diverted to storage in New Bullards Bar Reservoir for later releases. Moreover, in drier years, the amount of available water is only a fraction of this long-term average.

In the development of the Yuba Accord, it was determined by the biologists that the available water for instream flows, if all irrigation demands were met, would not be enough to maintain fish in good condition in the driest years. Therefore, two mechanisms were developed to ensure the availability of water for instream flows over the full range of hydrology (with the exception of Conference Years, which have their own set of criteria for instream flows). First, as part of the Yuba Accord, a conjunctive use program was developed. This program includes agreements with seven of the YCWA Member Units. These agreements provide for maintaining the groundwater basin in a healthy condition so that, if diversion shortages are imposed, then groundwater from this basin can be pumped and used to make up for some or all of the shortages. Modeling completed for the Yuba Accord Environmental Impact Report/Environmental Impact Statement (YCWA et al. 2007; 2008) shows that shortages in irrigation deliveries are expected to occur in about 1 in 8 years, on average, for future demands of approximately 345,000 acre-feet. The Conjunctive Use Agreements also provide for the pumping of 30,000 acre-feet of groundwater for irrigation in Schedule 6 years, and for a corresponding amount of water to be released from New Bullards Bar Reservoir storage in the summer when flows would be at their lowest, to maintain suitable flows and water temperatures for spring-run Chinook salmon and steelhead holding and rearing in the river.

Under either the 40 percent or the 50 percent scenario, the frequency and magnitude of shortages would be so great that the conjunctive use program would not be able to replace the lost irrigation supplies in some years. The estimated annual capacity to pump groundwater for irrigation in the Member Units' areas is about 120,000 acre-feet per year. However, the basin cannot sustain this amount of annual pumping on a recurring basis.

The 50 percent scenario would result in some irrigation shortages in all but one year of the 29-year simulation period. These shortages would occur due to three conditions: (1) if New Bullards Bar Reservoir storage would not meet the end-of-September carryover storage target, then a shortage would be imposed for the current irrigation season until April 1st of the following year; (2) if New

Bullards Bar reservoir storage would be depleted to minimum pool, then no irrigation diversions would be made; and (3) a daily imposition of cuts to irrigation deliveries could be needed to meet the 40 or 50 percent of unimpaired flow standard at Marysville. Regarding this third condition, substantial irrigation deliveries from the lower Yuba River start in May, when flood-up for rice occurs and when latent soil moisture no longer supports tree and truck crop growth. Because the 40 percent or 50 percent of unimpaired flow criteria would be imposed until the end of June, for some time periods there would not be enough release capacity to meet both the flow criteria and irrigation deliveries. The result would be irrigation delivery shortages in the spring of almost all but the driest years, and the shortages would be greatest in the wettest years. This condition would occur in both the 40 and 50 percent of unimpaired flow scenarios.

In the 5 year period of 1977 to 1981 and the 6 year period of 1987 to 1992, the average annual shortages for the 50 percent scenario would be 93,775 acre-feet and 86,747 acre-feet, respectively. For the 40 percent scenario, the average annual shortages for the 1997 to 1981 period would be 63,646 acre-ft and for 1987 to 1992 these shortages would be 18,116 acre-ft. Although 1977 is the driest year of record, only one of the other four years during the 1977 to 1981 period is dry. Nevertheless, there still would be significant shortages in these other years due to the conflicts of competing water demands under both the 40 percent and 50 percent scenarios. Under baseline conditions, the average shortage in the 1977 to 1982 period would be 32,657 acre-feet, and that shortage would be a result of 1977 shortages that would continue into early 1978. Under the Baseline Condition flow scenario, there would not be any shortages during the 1987 to 1992 period.

Figure 17 is a graph of annual irrigation demand shortages as a percentage of the irrigation demand for the 40 and 50 percent scenarios.

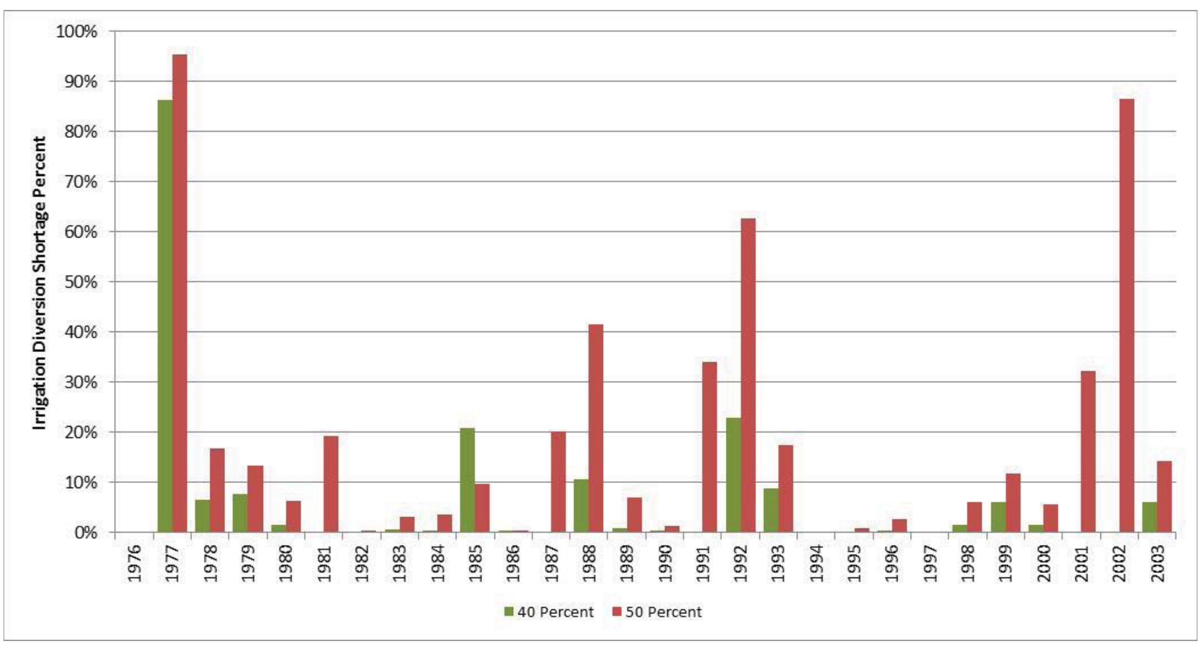


Figure 17: Shortages in Irrigation Deliveries as a Percent of Demand for the 40 and 50 Percent Unimpaired Flow Scenarios

A portion of shortages in irrigation diversions from the lower Yuba River could be made up with additional groundwater pumping, although such pumping would be limited by several constraints. As previously stated, the maximum pumping volume that can be produced from wells is about 120,000 acre-ft per year. However, due to cultural irrigation practices and the variable timing and amounts of irrigation supplies used for the range of crops, the effective amount of pumped groundwater that can be put to beneficial use is less than the full 120,000 acre-ft. Also, four of the 29 years of simulation have shortages greater than 120,000 acre-ft. Therefore, even using this upper bound of grounding pumping volume, not all of the shortage could be mitigated with groundwater pumping.

Groundwater basin storage is also a limiting factor for groundwater supplies for irrigation. Groundwater pumping must be sustainable for the long term without overdrafting the basin. The average irrigation diversion shortage for the 50 percent scenario for the entire period of simulation is about 56,000 acre-ft per year. Although the entire Yuba Basin might be able to sustain this level of pumping, under existing conditions, it is not certain that it could. Also, this level of groundwater pumping from the basin would not leave any future groundwater supplies for other uses.

Water Supply Shortages as an Ineffective Measure to Eliminate Instream flow and Coldwater Pool Impacts of a Percent of Unimpaired Outflow Criteria

In a system in which water supplies are not sufficient to satisfy all water demands in all years, increasing one component, such as a requirement to provide additional outflow, would mean that other components of the total water demand would have to decrease. With increases in the total volumes of water that would be dedicated to stream flows, and thus not available for Yuba County irrigation supplies, either more water must be released from storage or irrigation demands must be reduced, or both. For the Yuba Accord, it has been shown in this analysis and previous analyses that using additional storage for greater releases in one year would impact the next year’s flow schedule and the resulting flows in the lower Yuba River. Greater storage releases also probably would result in depletion of the cold-water pool in New Bullards Bar Reservoir in some years, which would result in higher water temperatures in the lower Yuba River, which would impact listed salmonids. The alternative to increasing storage releases is further restrictions on irrigation diversions. An analysis was undertaken to determine if additional irrigation shortages could be used as a mechanism to limit or eliminate the impacts of implementing the 40 percent or the 50 percent of unimpaired flow criteria on the Yuba Accord, the resulting instream flows, and reservoir storage, and therefore avoid depletion of the cold-water pool in New Bullards Bar Reservoir.

This analysis was set up to eliminate the Conference Years, to eliminate the impacts due to shifting of Yuba Accord flow schedules to drier schedules and to ensure that New Bullards Bar Reservoir storage would not fall below 330,000 acre-ft by the end of the water year on September 30th, to partially reduce the releases of warmer water due to depletion of the cold water pool. The 330,000 acre-ft carryover target is a rough estimate of the amount of reservoir storage needed to avoid the release of significantly warmer waters. Even at this level of storage, some warming of releases would be expected to occur. For the Yuba Accord flow schedules, the approach used included mitigating the shift of flow schedules from a schedule 2 or higher that occurs under baseline conditions to any higher schedule under the unimpaired flow scenarios. Shifts from Schedule 1 to Schedule 2 were not mitigated because both Schedule 1 and Schedule 2 were considered to be in the "range of optimal flows" by the biologic technical team that formulated the Accord flow schedules.

The first iteration in the analysis to mitigate the impacts of the 40 percent and 50 percent of unimpaired outflow criteria used a perfect foresight approach for the following water year conditions. That is, modeled irrigation shortages were imposed in the current year to mitigate the impacts that would appear in the following year, as if the YRDP operators knew what the following year hydrologic conditions would be. Higher carryover storage requirements were applied for the years when lowered end of water year storage in New Bullards Bar Reservoir impacted the subsequent year's Yuba Accord flow schedule. Using a higher carryover storage requirement would force greater irrigation shortages in the current year to achieve higher carryover storage at the end of the water year. In addition to mitigating impacts to the following year's Accord flow schedule, modeled carryover storage requirements were raised (forcing greater irrigation shortages) for current years in which there were releases of substantially warmer water due to cold water pool depletion. Because perfect foresight was used in the first iteration of this analysis, only the years that were followed by dry years needed to be mitigated to avoid flow schedule changes. However, in actual practical application, the hydrologic conditions of the next year are not known. Therefore, once the impacts of the percentage of unimpaired outflow criteria were mitigated with perfect foresight, the analysis was re-run using carryover storage targets from the first iteration, applied to all years as minimum carryover storage. In this way, the potential for a future impact would be mitigated, as would have to be done in actual practice.

Figure 18 is a plot of irrigation delivery shortages for the 40 and 50 percent scenarios that result from the requirement alone, plus the additional shortages resulting from the attempt to mitigate the impacts to Yuba Accord flow schedules and cold water pool depletion.

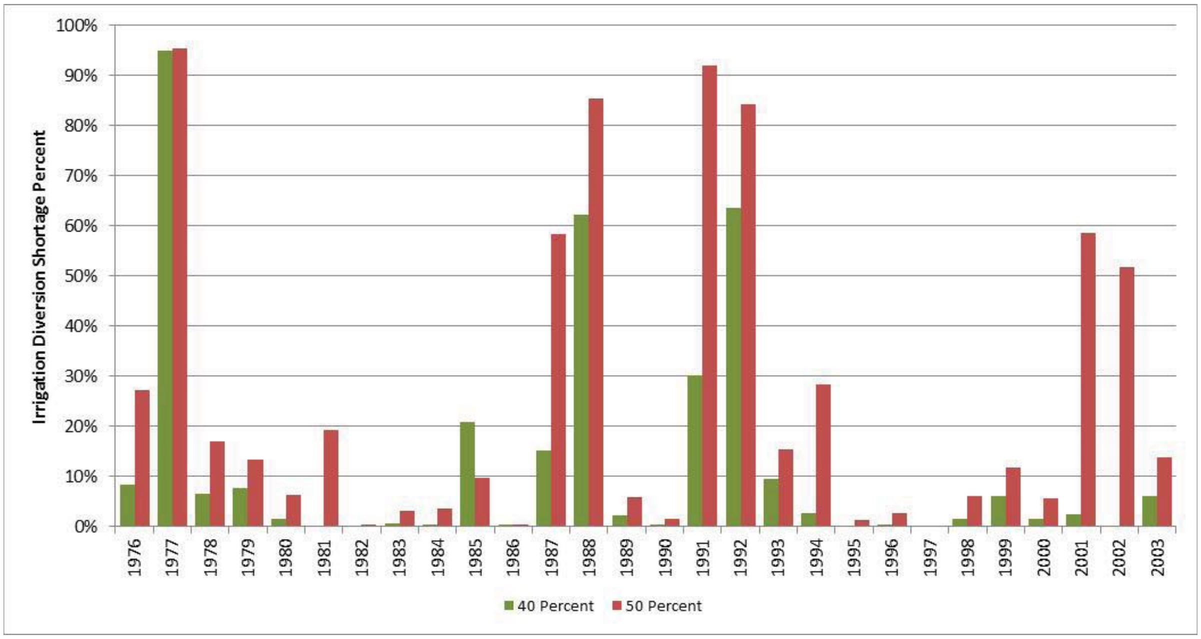


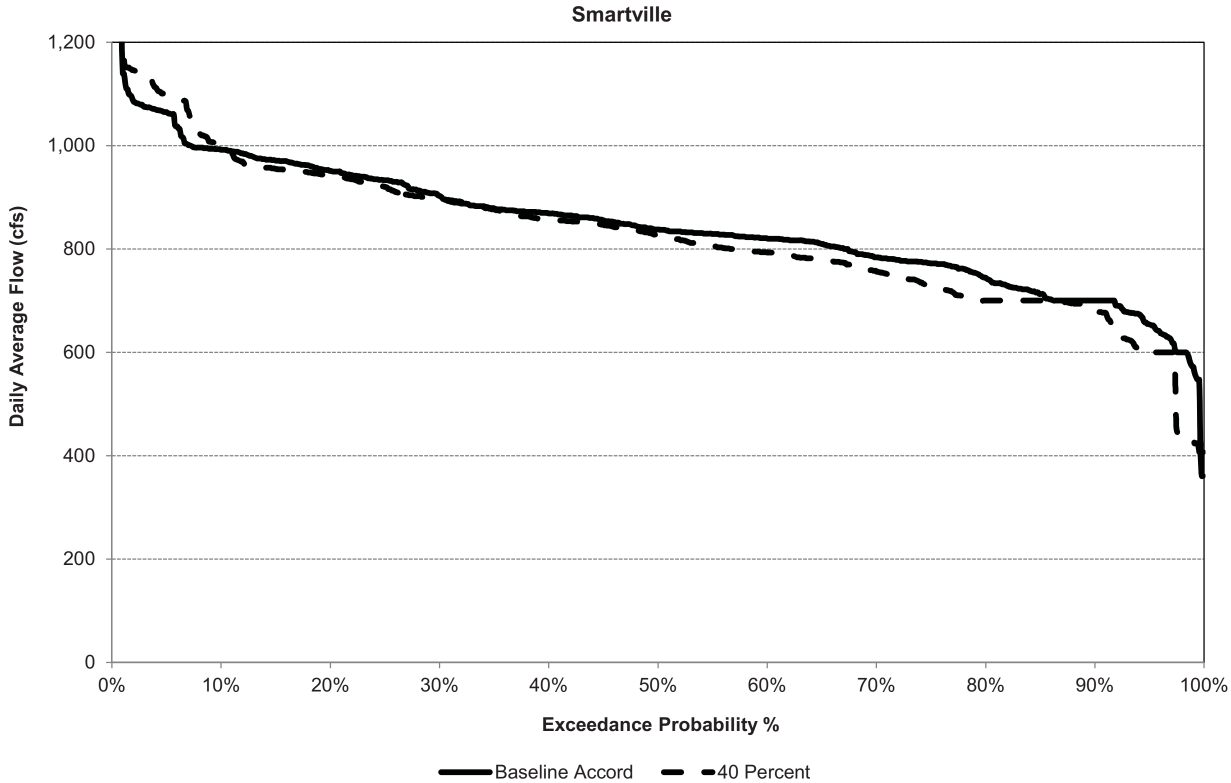
Figure 18: Shortages in Irrigation Deliveries as a Percent of Demand for the 40 and 50 Percent Unimpaired Flow Scenarios with Additional Shortages Imposed to Mitigate the Impacts of the Unimpaired Outflow Criteria

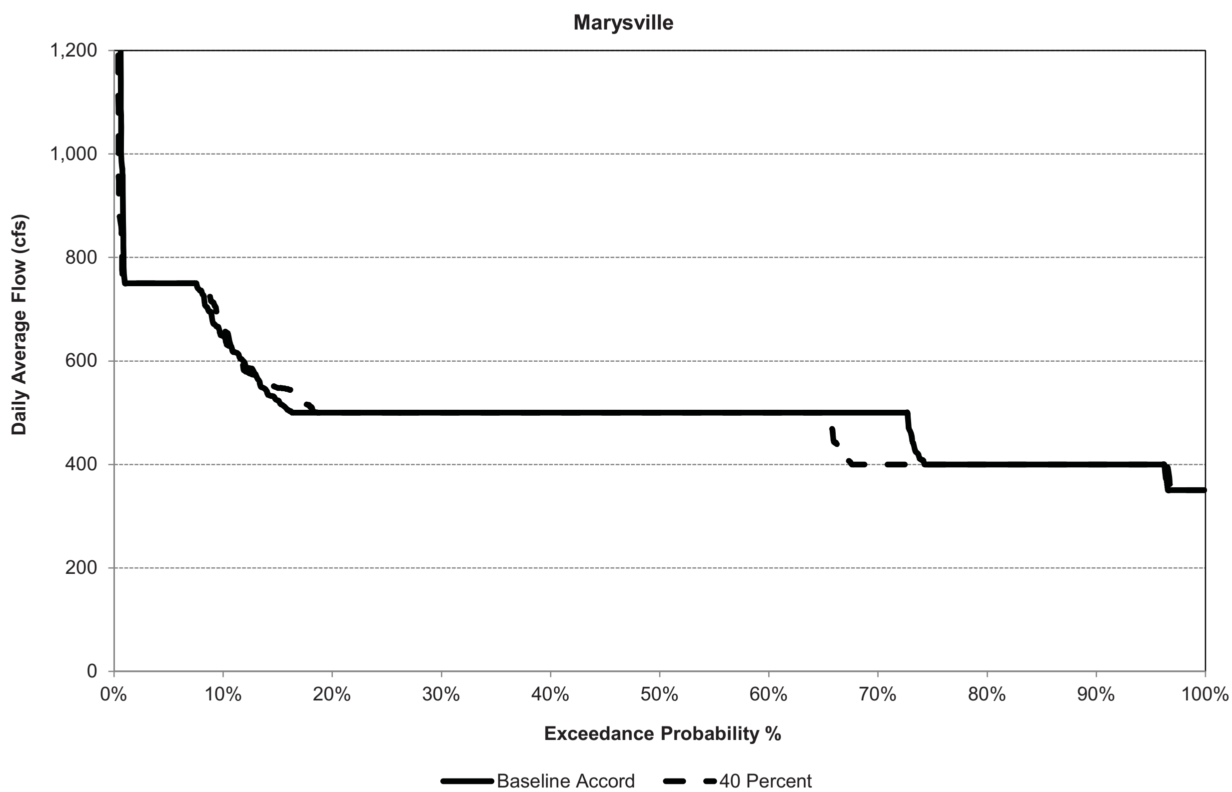
As seen in the figure, even for the 40 percent scenario, three of the seven critical years (1977, 1988 and 1992) have shortages of more than 60 percent. The average shortage for all critical years for the 40 percent scenario would be about 125,000 acre-ft, more than 1/3rd of the total irrigation demand. For the 50 percent scenario, the average critical year shortage would be about 225,000 acre-ft or about 74 percent of the irrigation demand. For the 50 percent scenario, the average shortage for all dry and critical years would be 171,000 acre-ft or about 56 percent of total demand, and the average shortage for all years would be 78,000 acre-ft, or about 25 percent of the total irrigation demand.

Two final important points should be made regarding this analysis. The attempt to mitigate for the impacts of the 40 and 50 percent of unimpaired outflow criteria did not result in compete mitigation of the impacts to potential Yuba Accord flow schedule changes or the impacts to storage in New Bullards Bar Reservoir that would result in the release of warmer waters to the lower Yuba River. The shortages would mitigate the impacts that the modeling simulation of 29 years of hydrology identified, but even in this modeling, reservoir storage was still significantly lower than storage under baseline conditions in most dry and critical years for both scenarios. This indicates a significant remaining potential for impacts to flows and temperatures on the lower Yuba River. Irrigation shortages could not be imposed to completely eliminate the potential for significant impacts to flows and temperatures because, even with no irrigation deliveries (100 percent shortages), storage in New Bullards Bar Reservoir would still be lower than under baseline conditions.

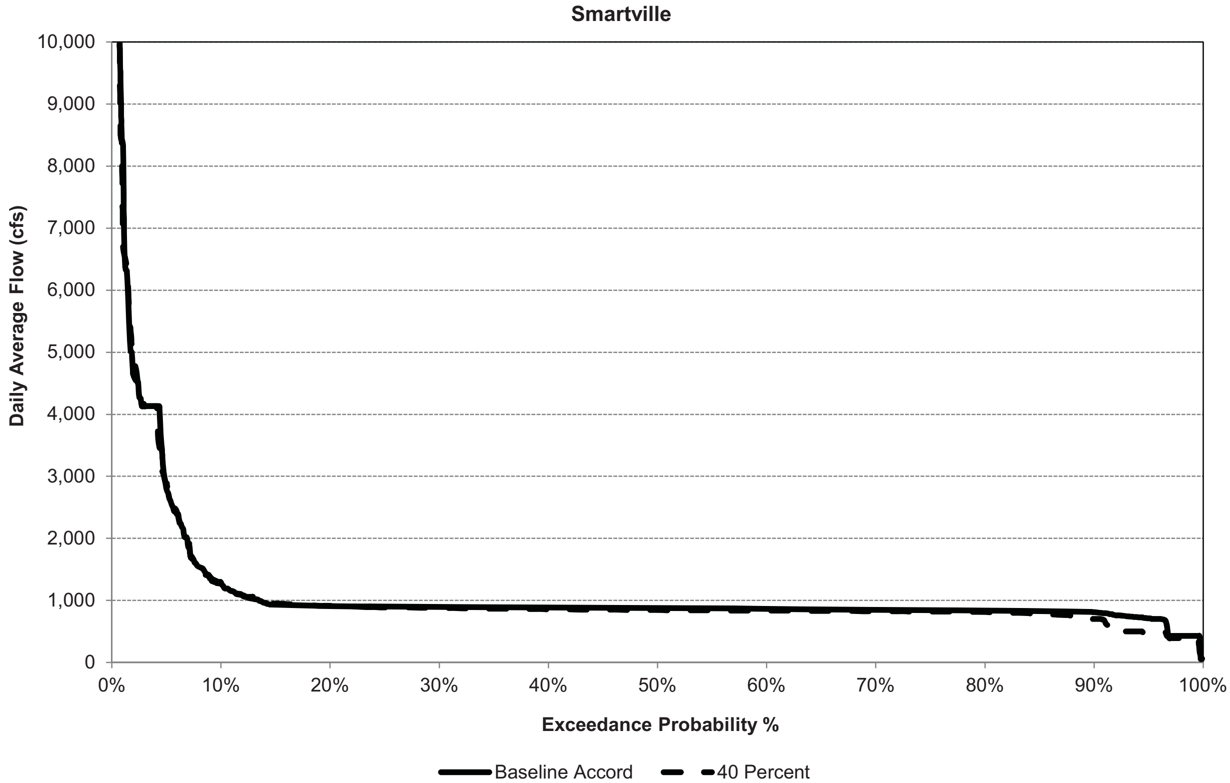
Appendix A: Flow Exceedance Probability Curves – 40 Percent of Yuba River Unimpaired Flow Scenario Compared to Baseline Conditions

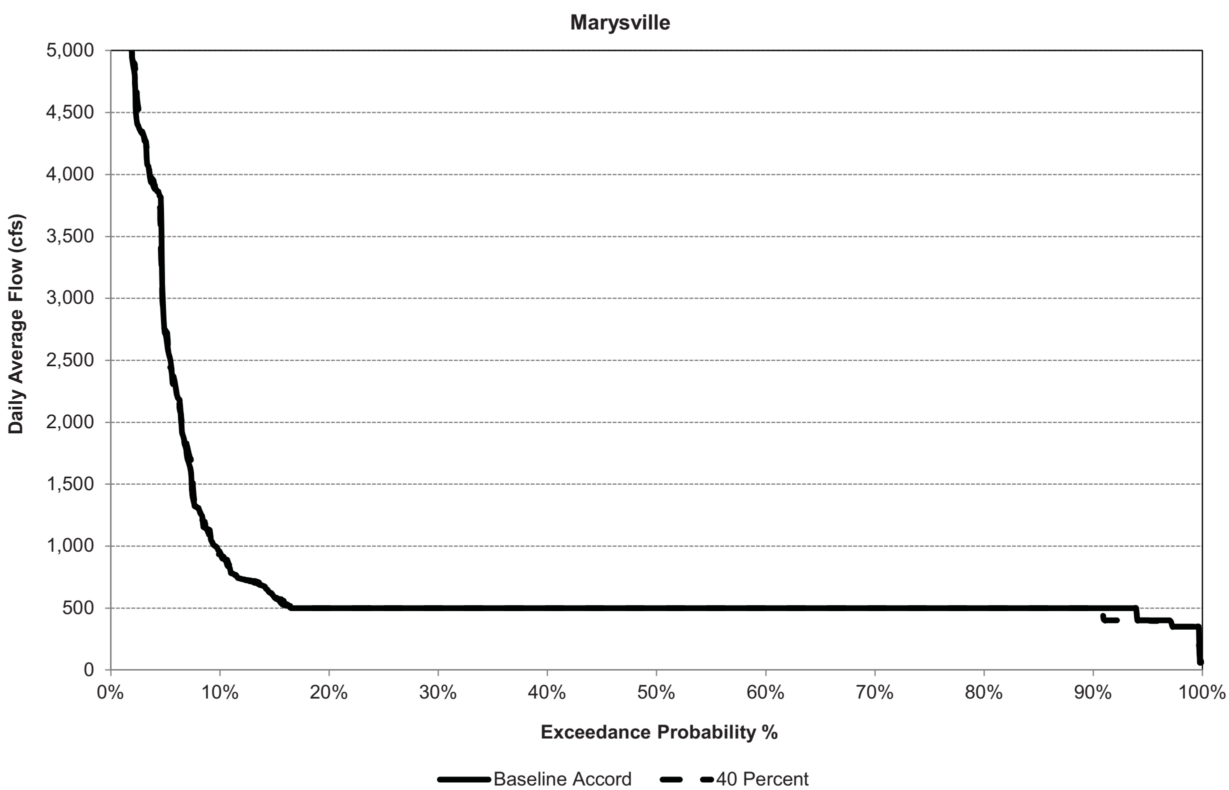
Exceedance Probability of Flow in October



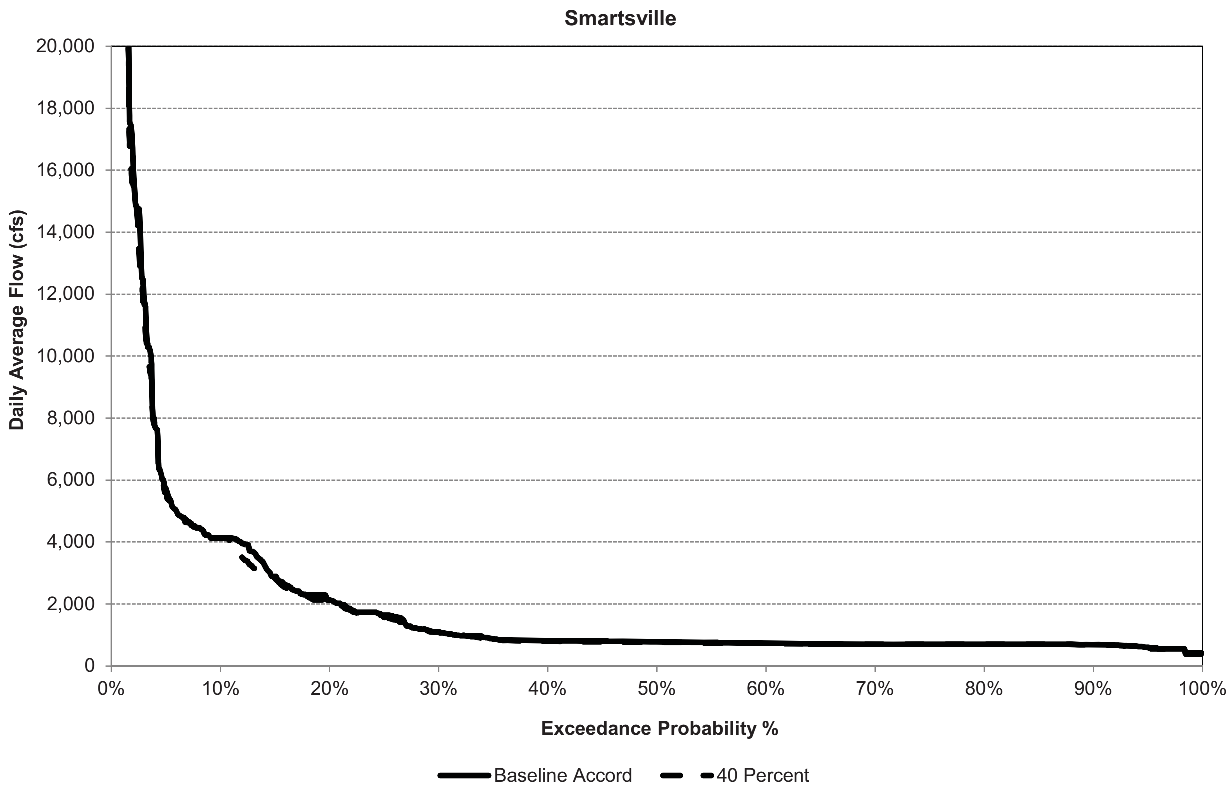


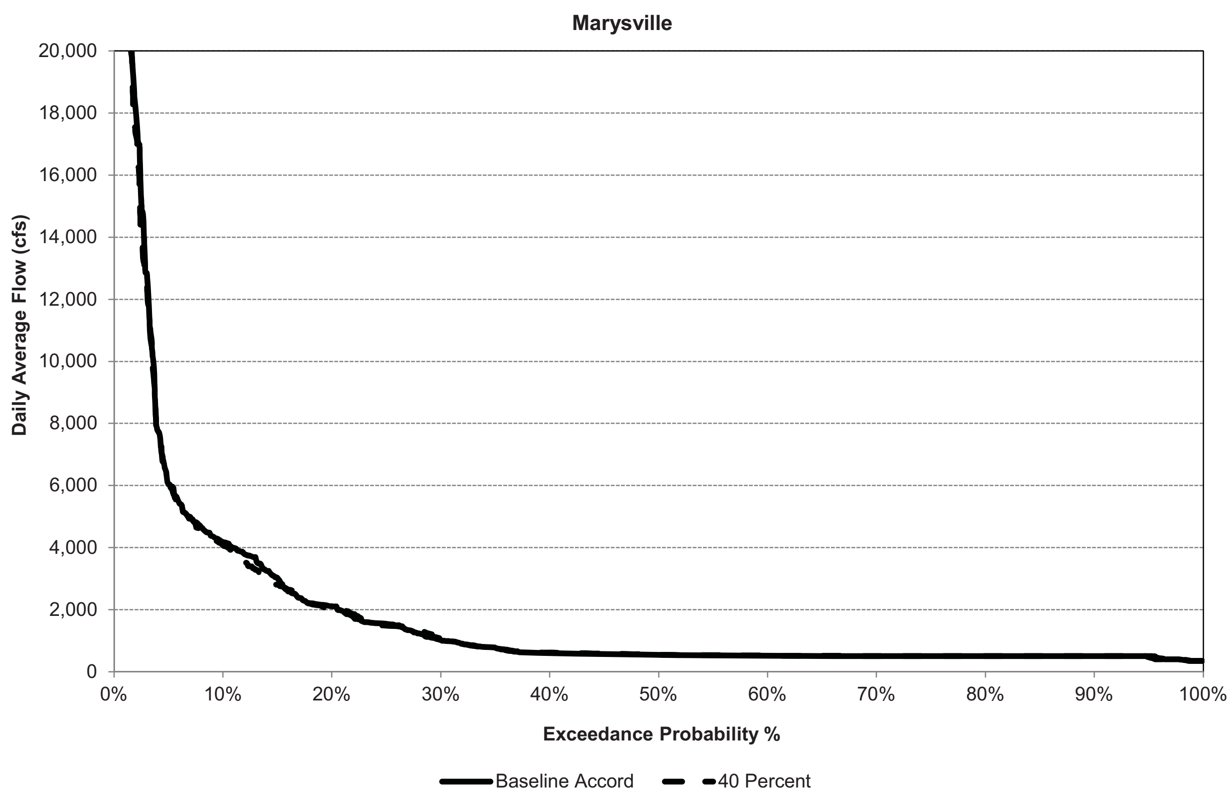
Exceedance Probability of Flow in November





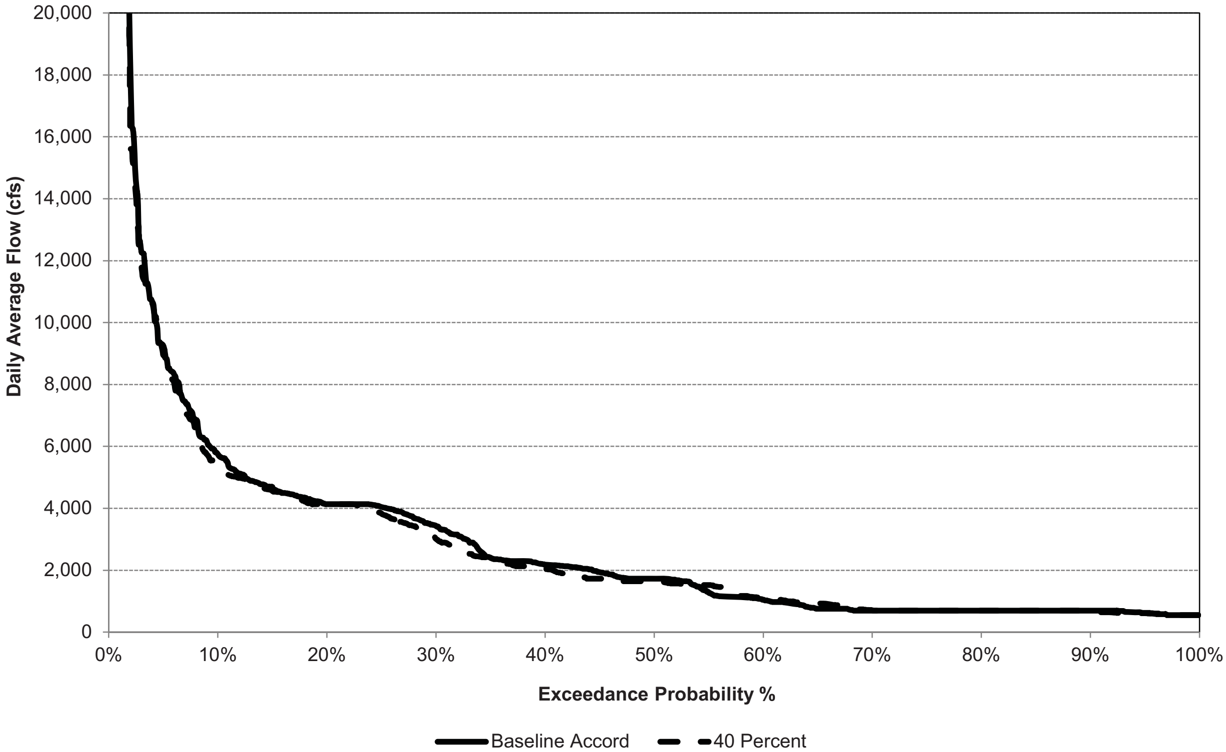
Exceedance Probability of Flow in December



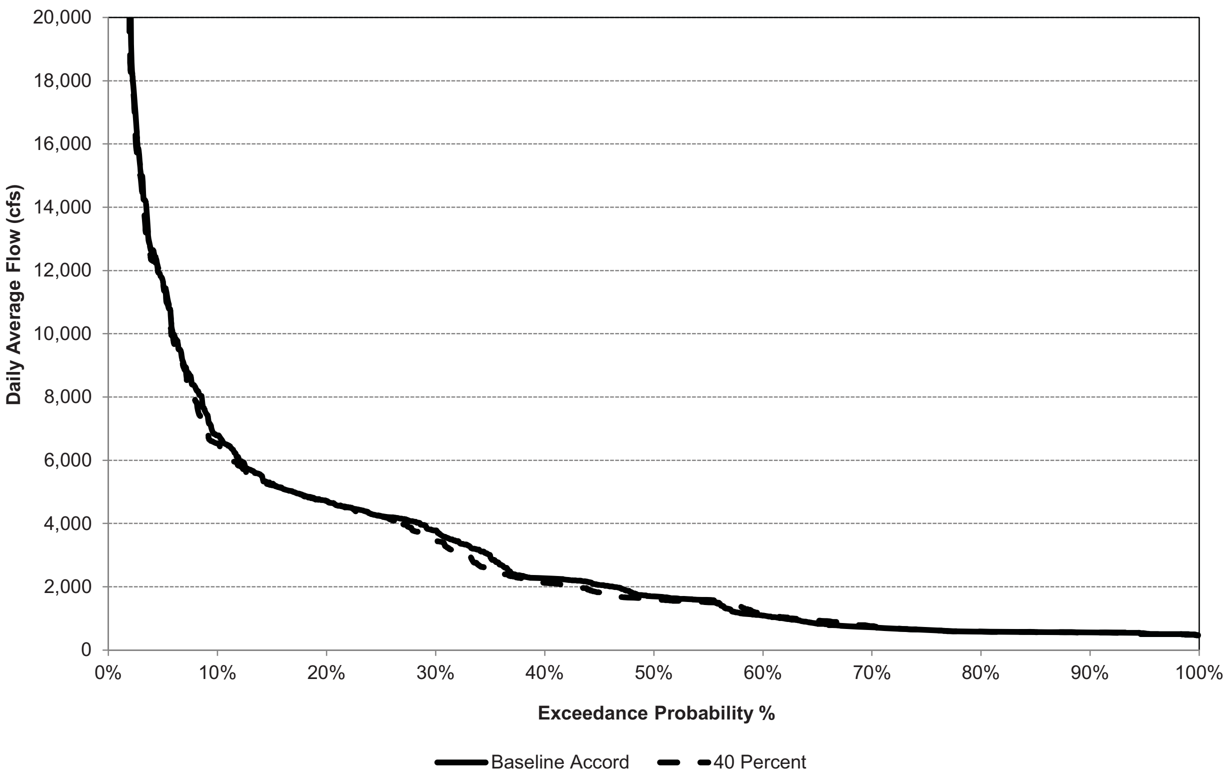


Exceedance Probability of Flow in January

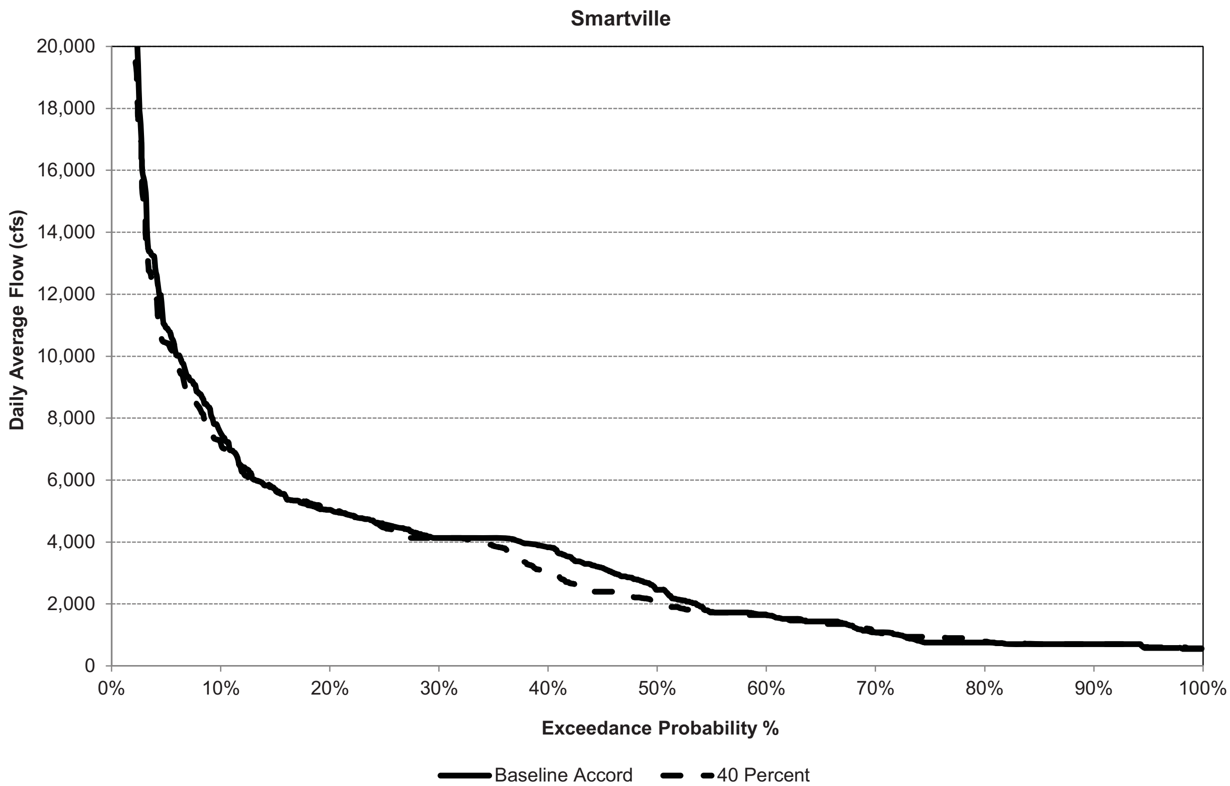
Smartville

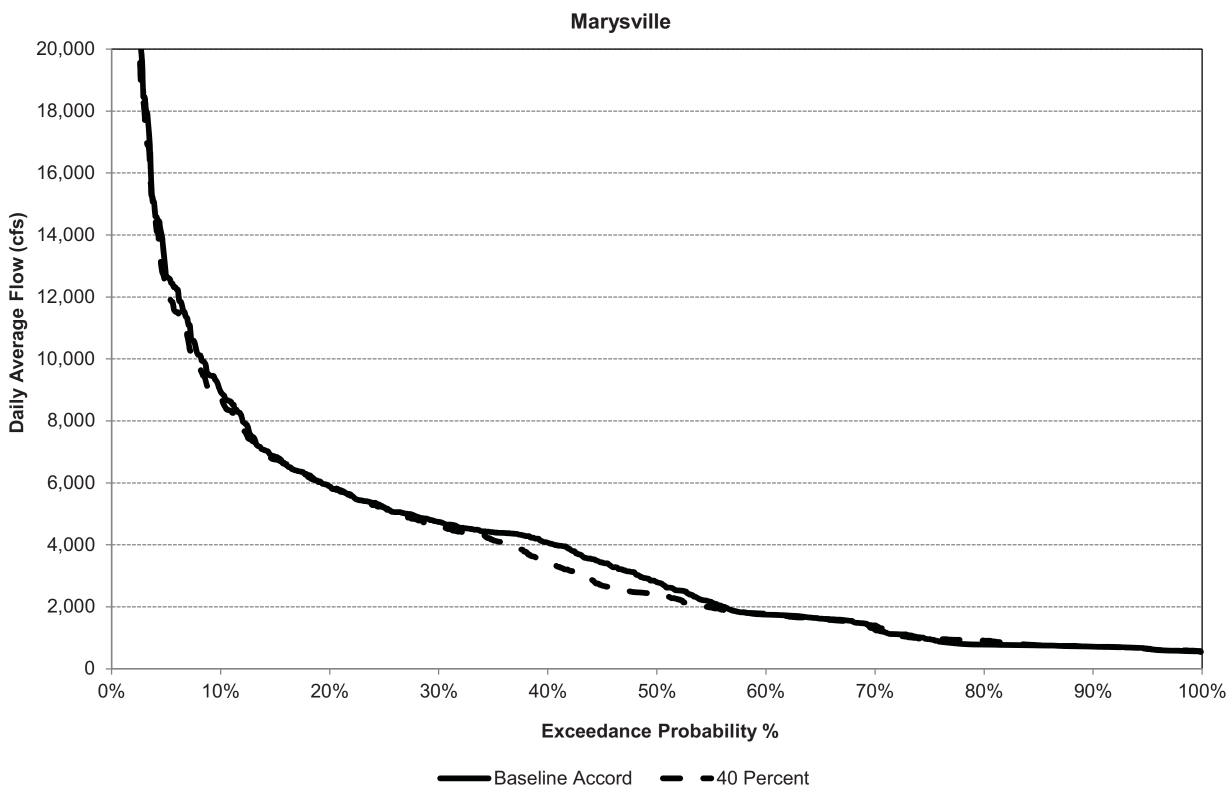


Marysville

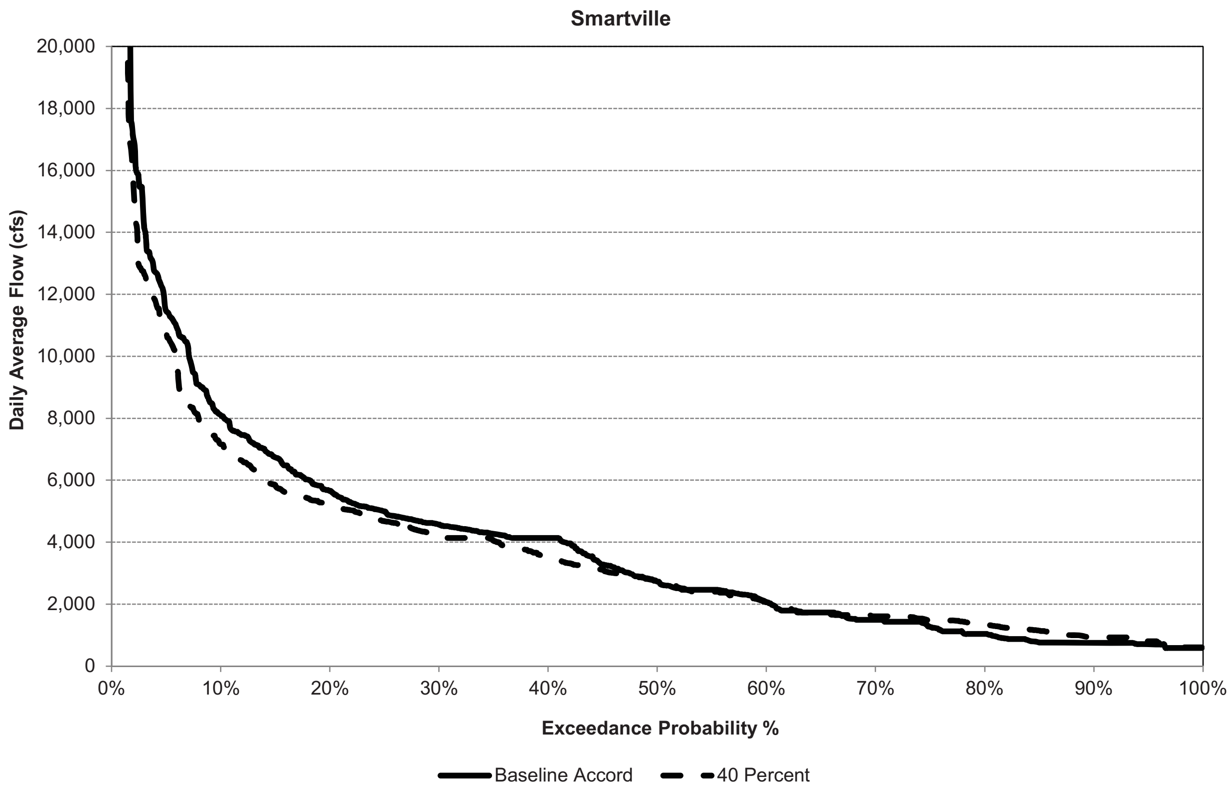


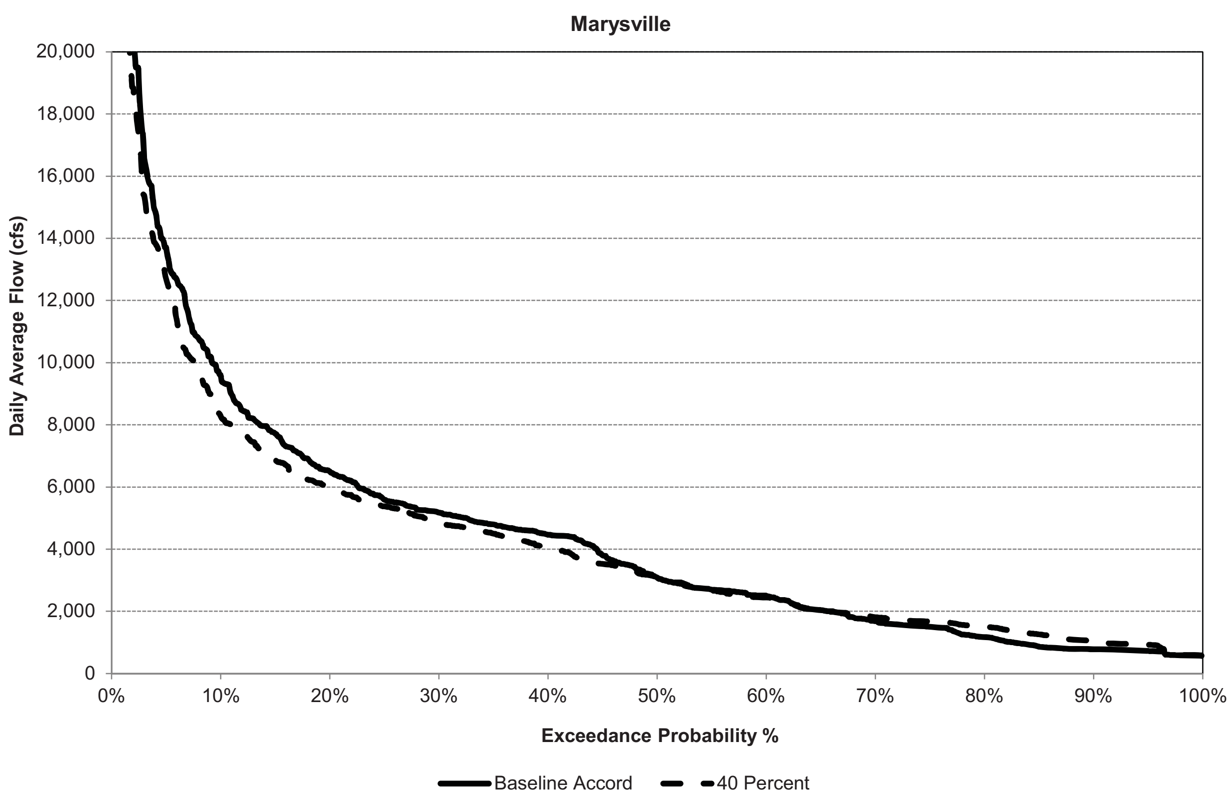
Exceedance Probability of Flow in February

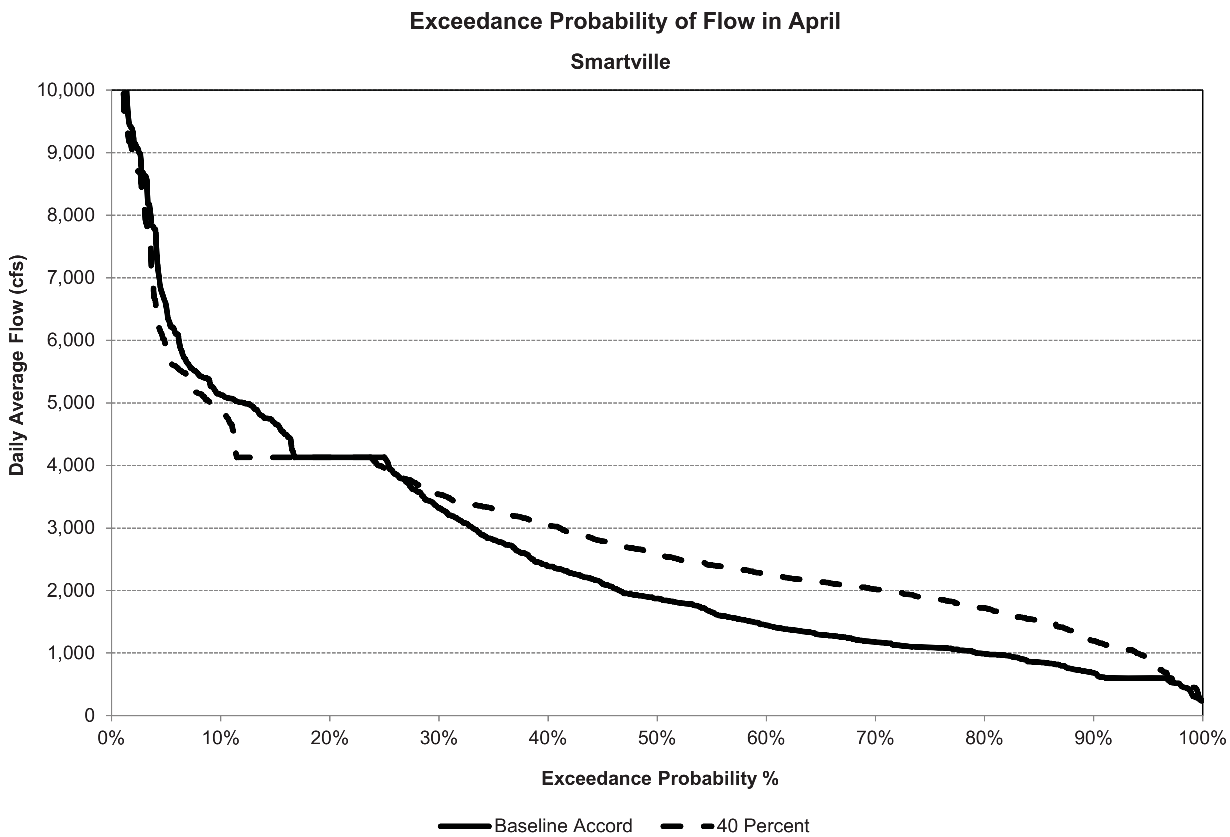


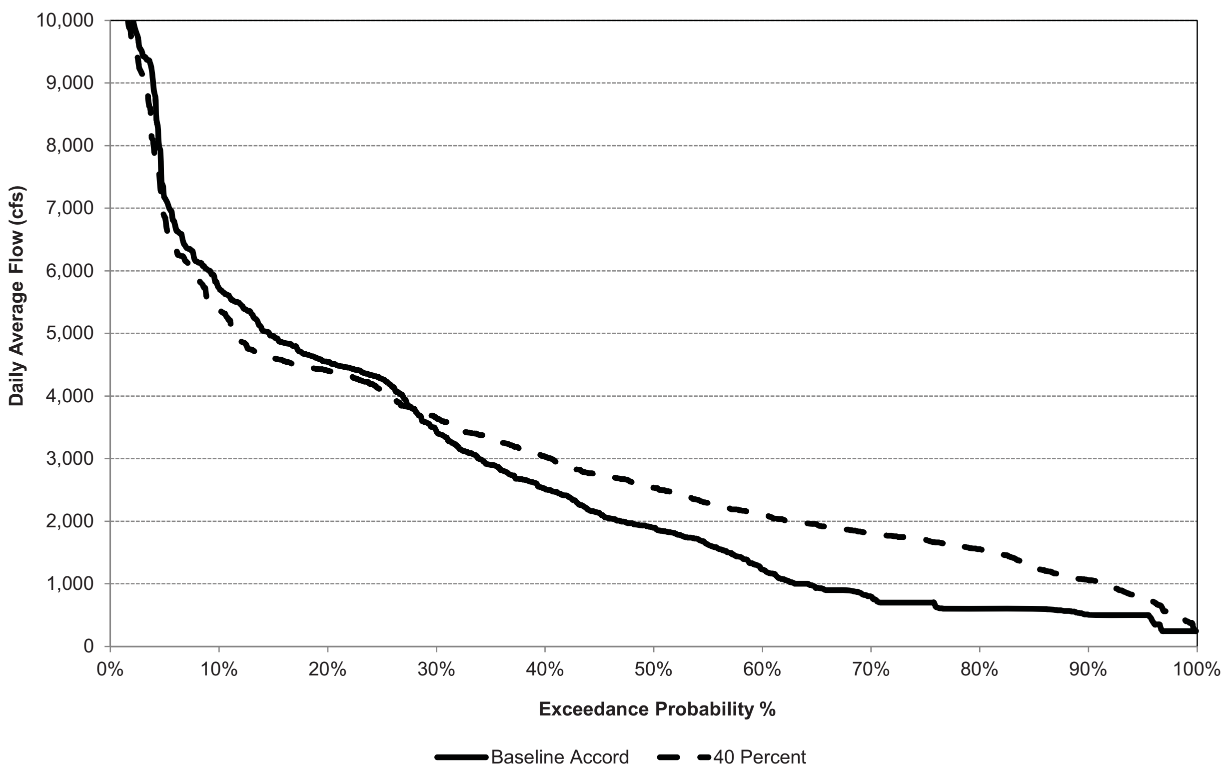


Exceedance Probability of Flow in March

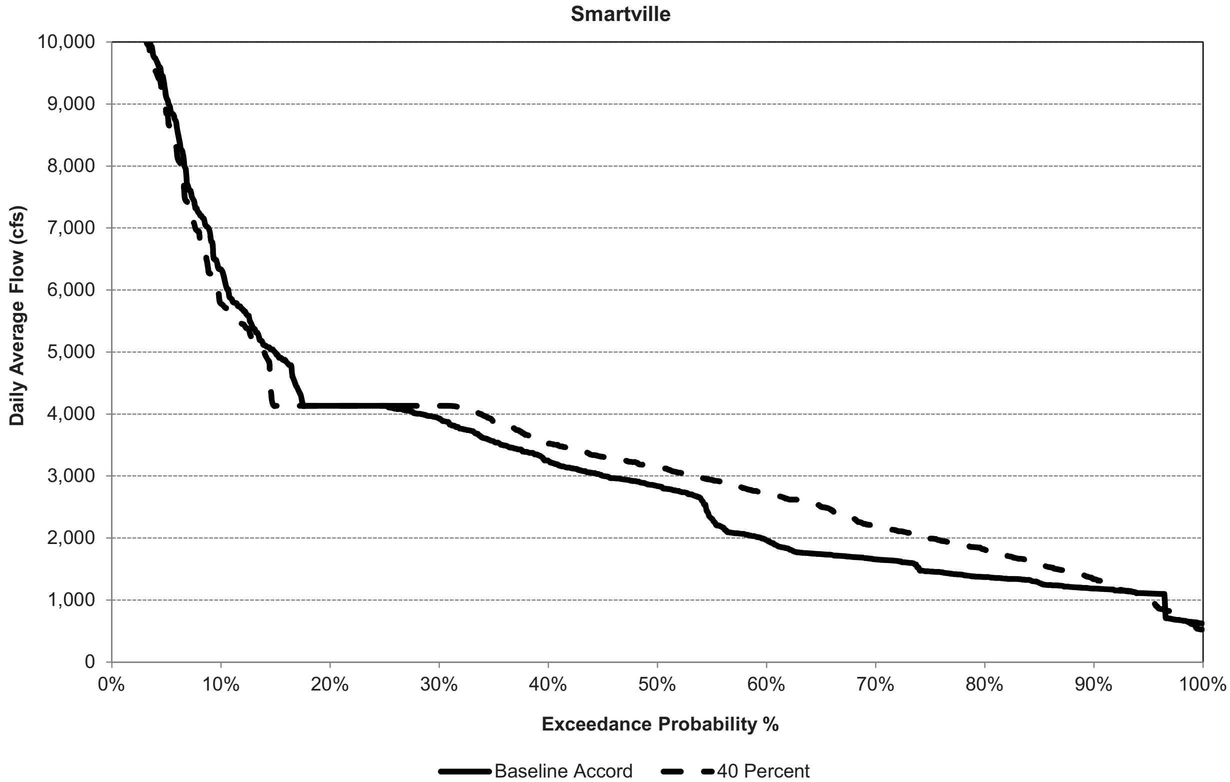


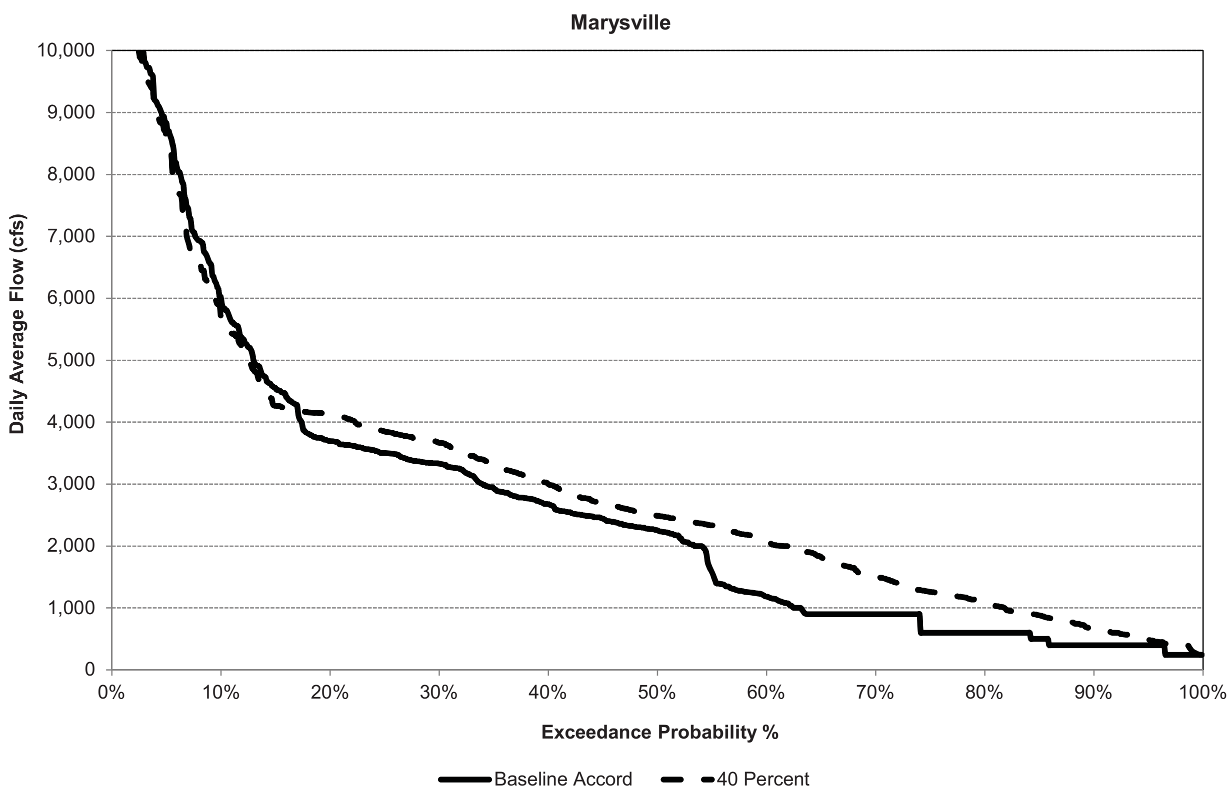



Exceedance Probability of Flow in April
Smartville
Daily Average Flow (cfs)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
40 Percent

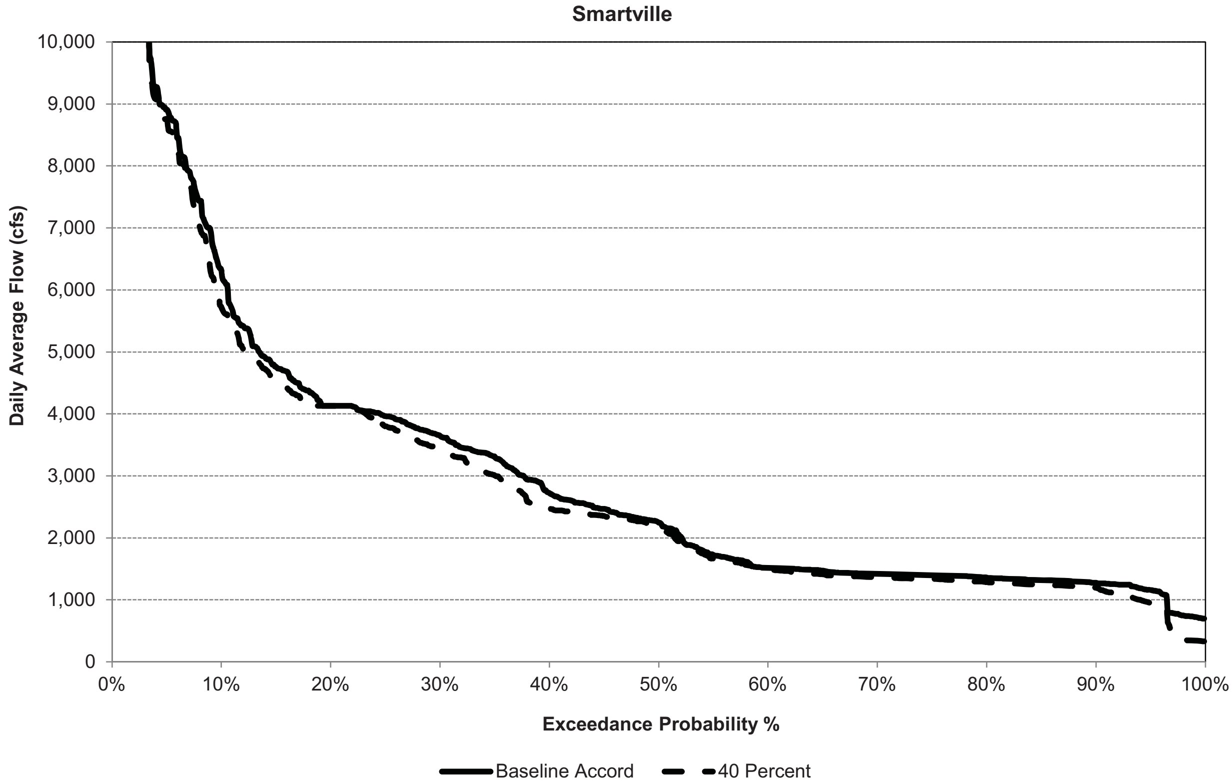

Daily Average Flow (cfs)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
40 Percent

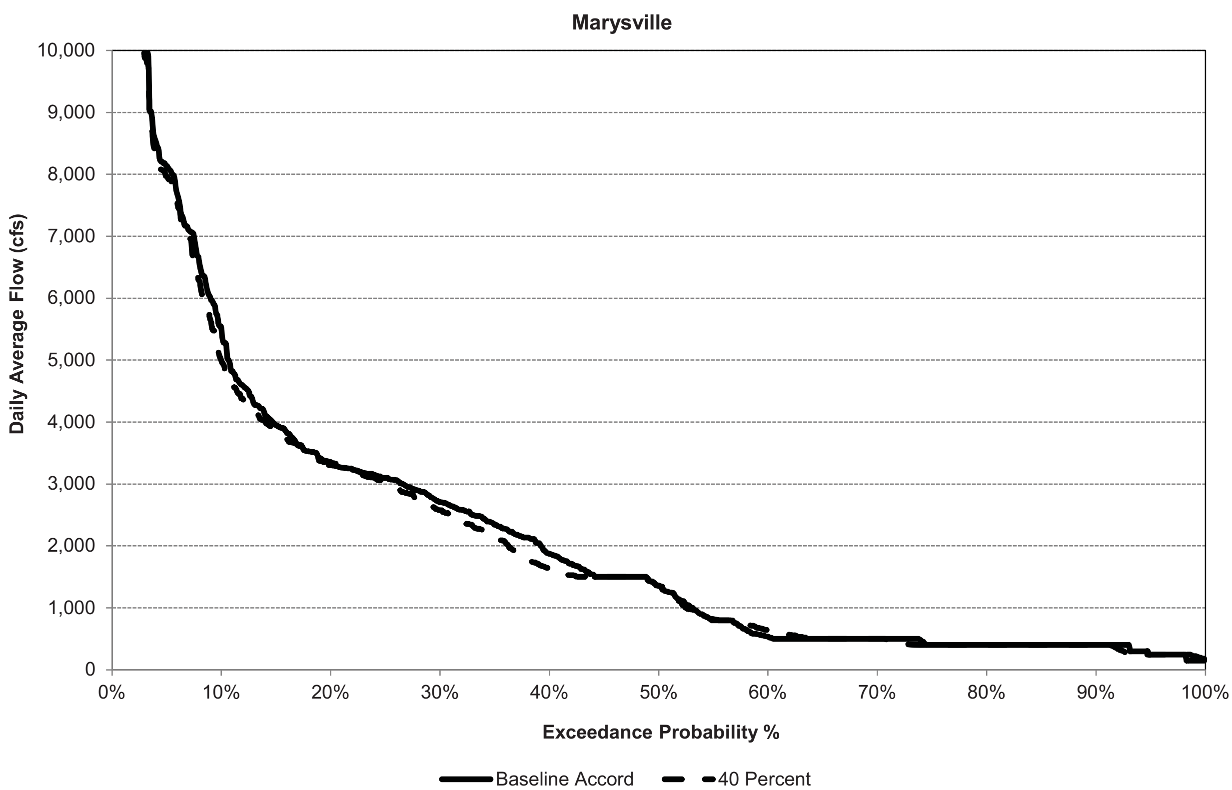
Exceedance Probability of Flow in May



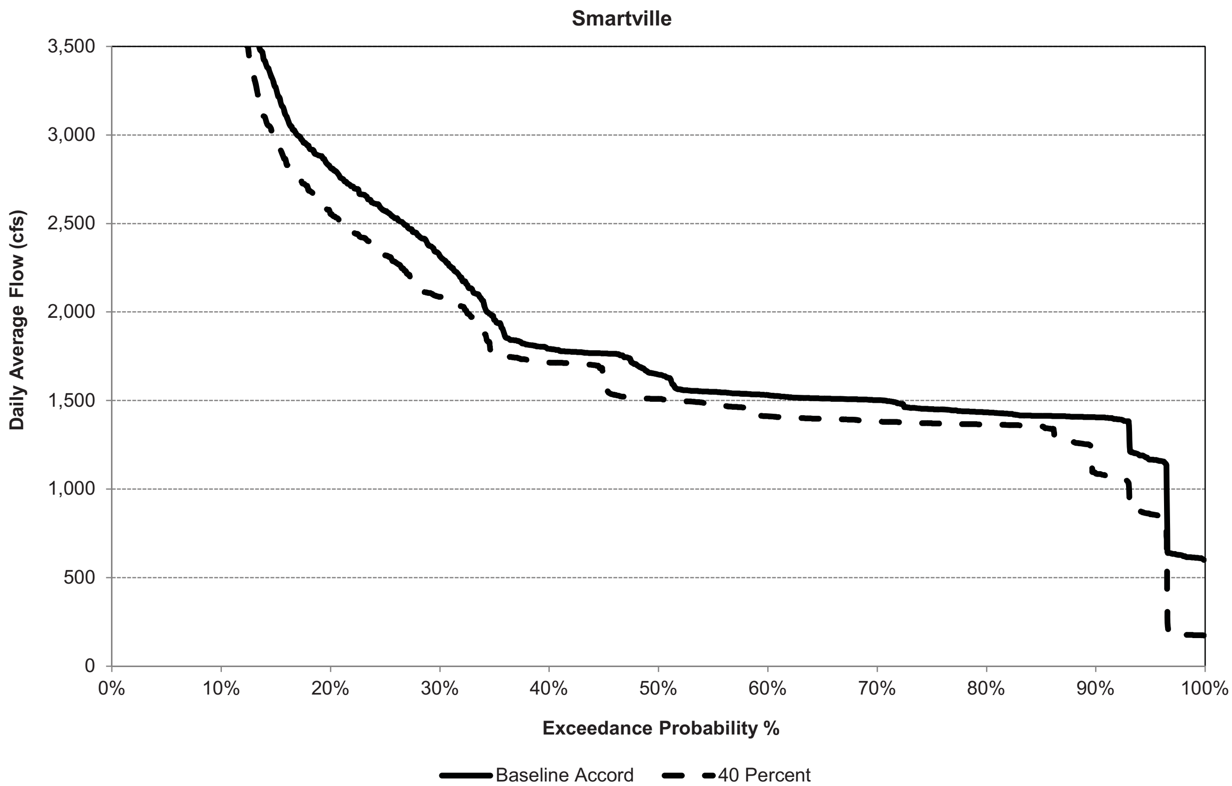


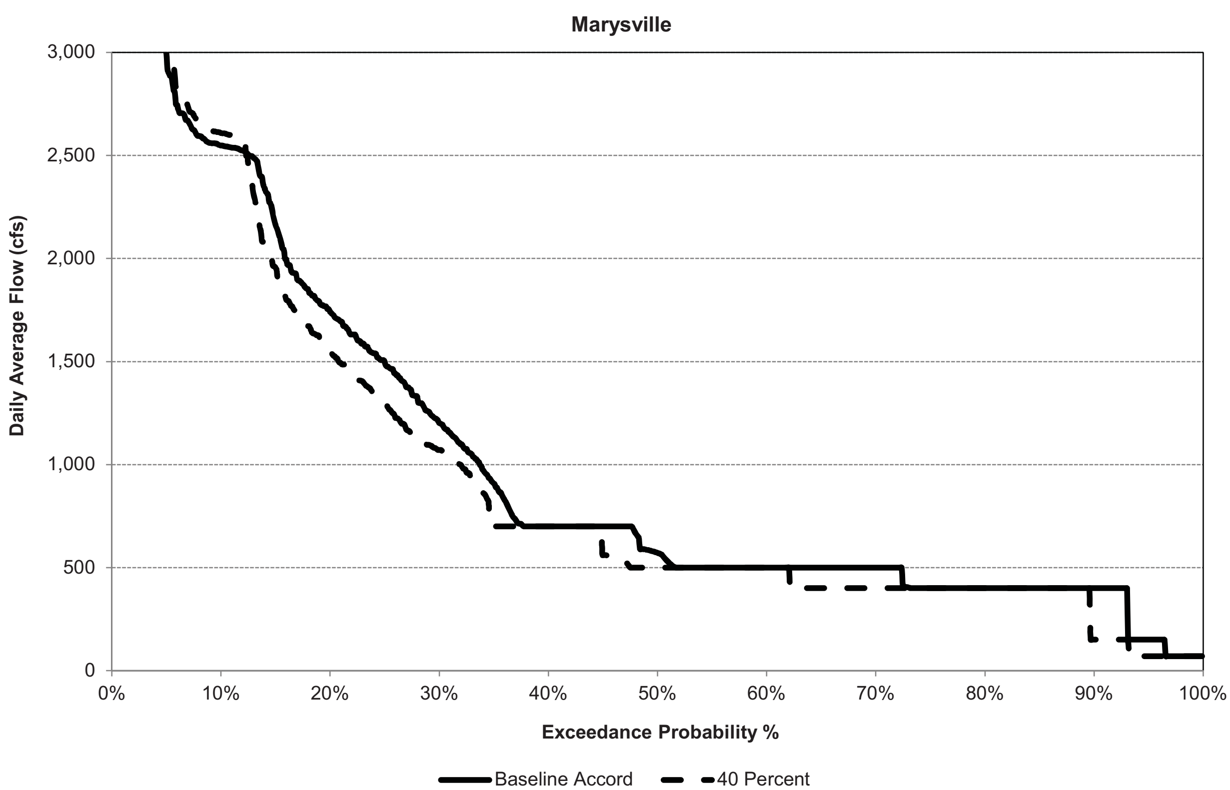
Exceedance Probability of Flow in June





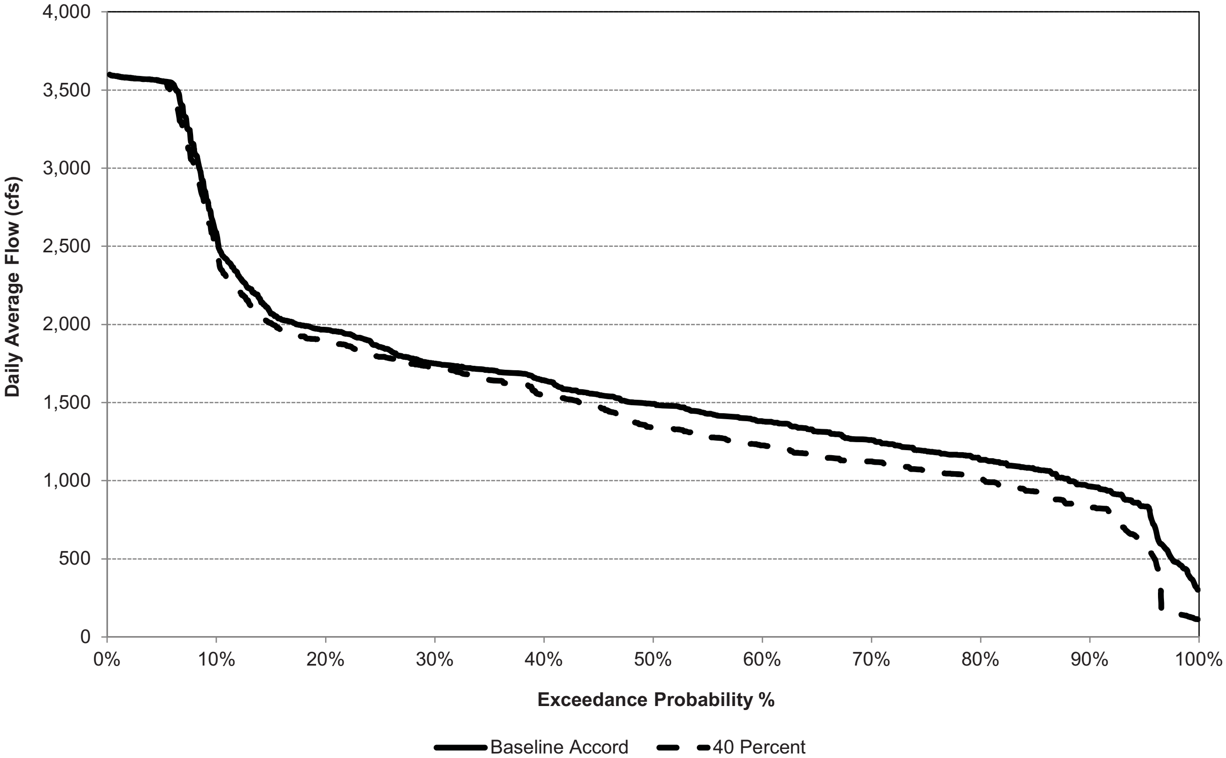
Exceedance Probability of Flow in July



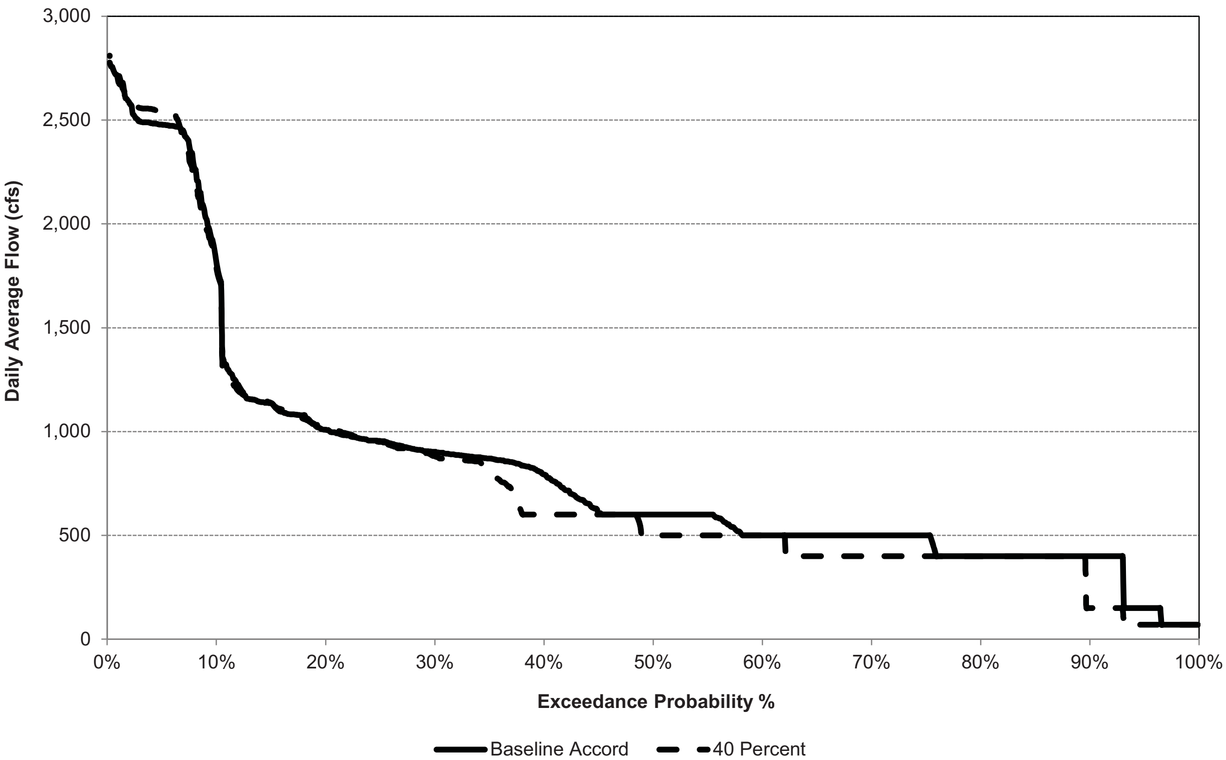


Exceedance Probability of Flow in August

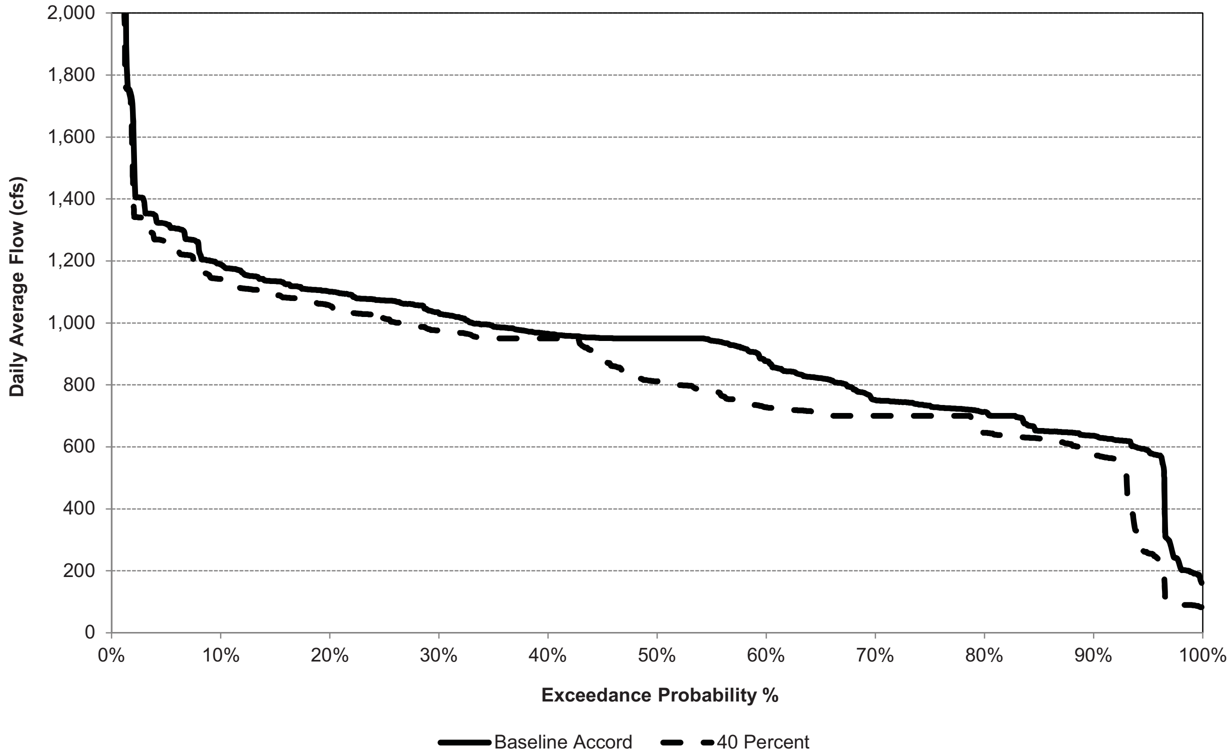
Smartville

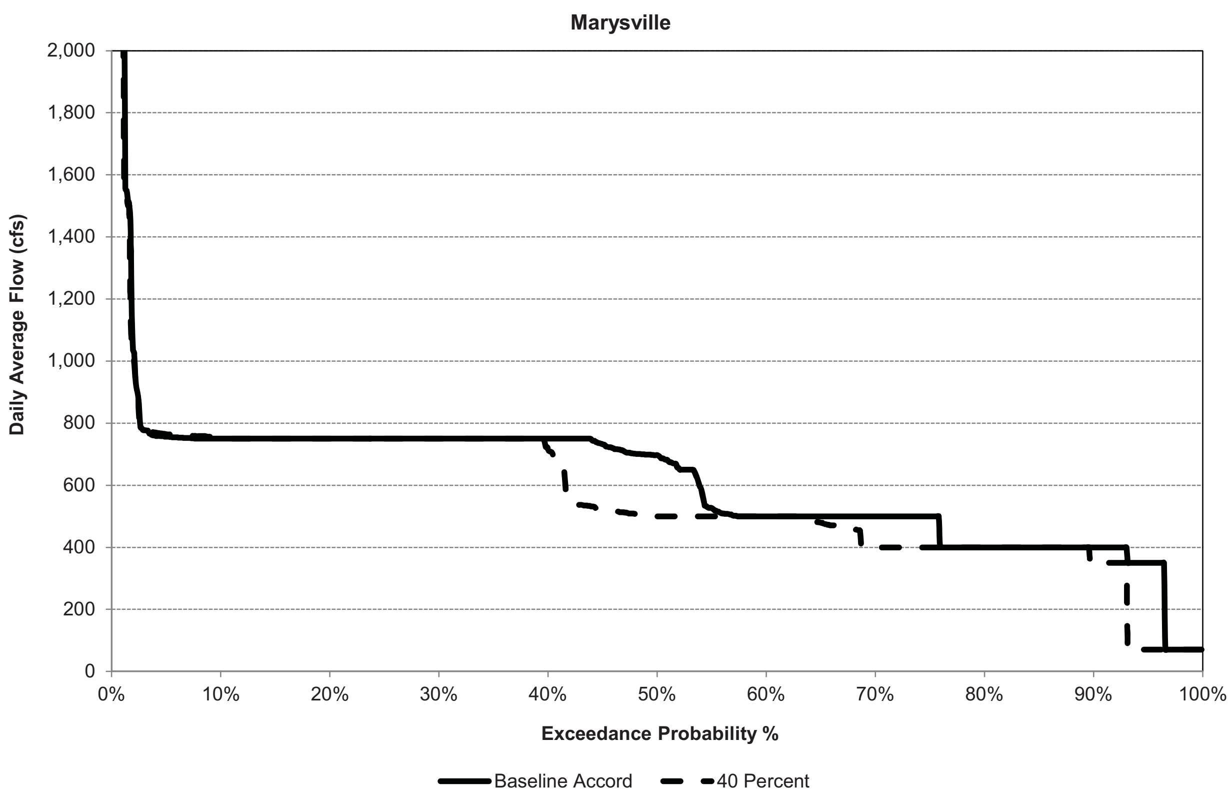


Marysville



Exceedance Probability of Flow in September

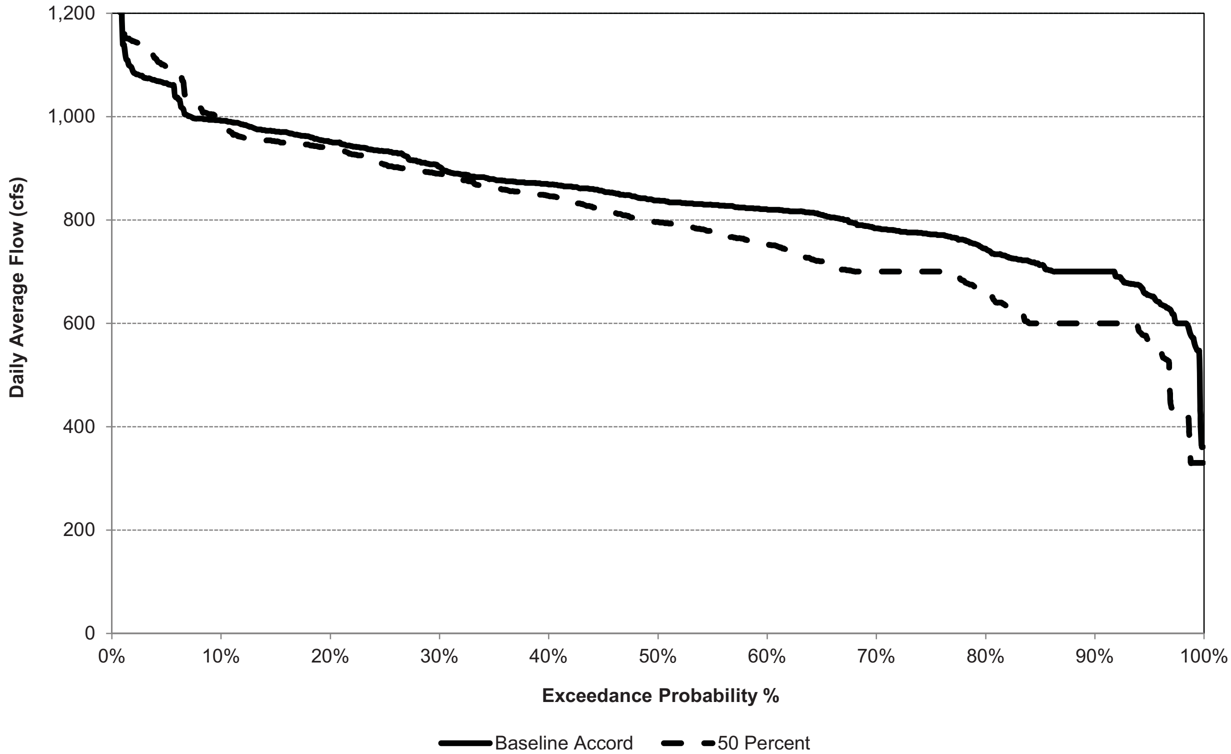




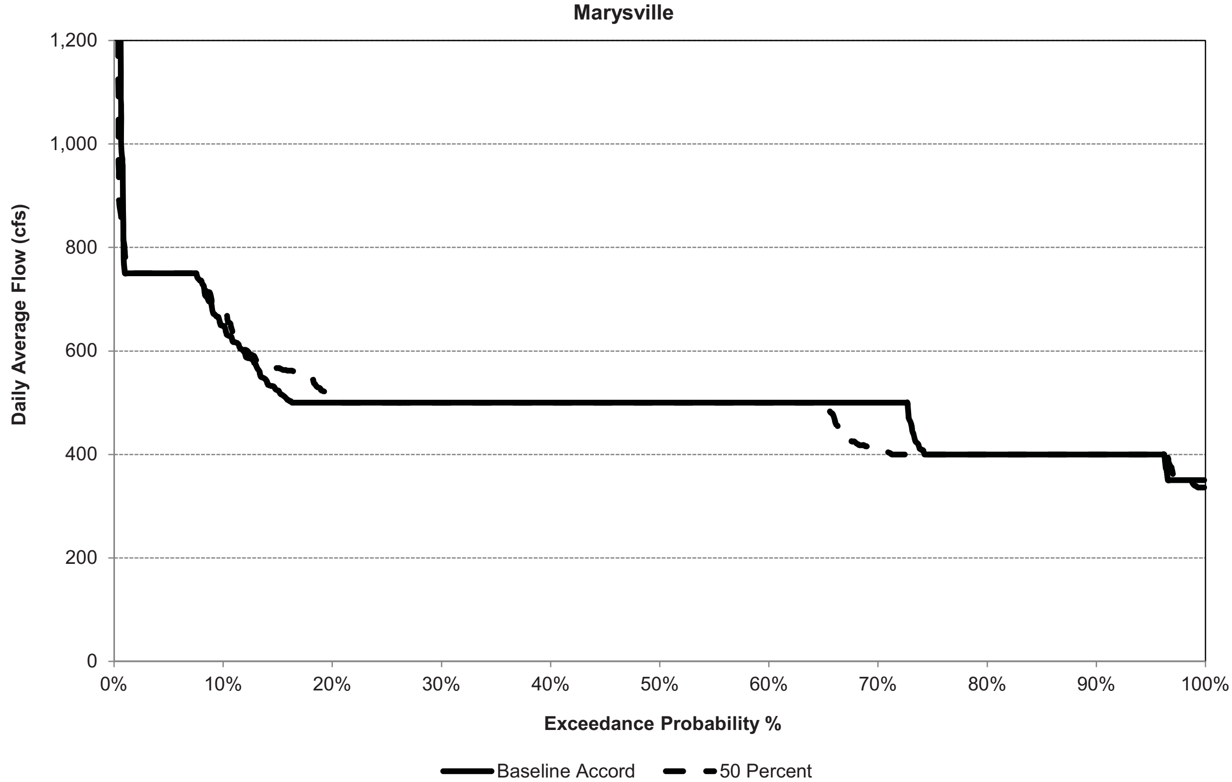
Appendix B: Flow Exceedance Probability Curves – 50 Percent of Yuba River Unimpaired Flow Scenario Compared to Baseline Conditions

Exceedance Probability of Flow in October

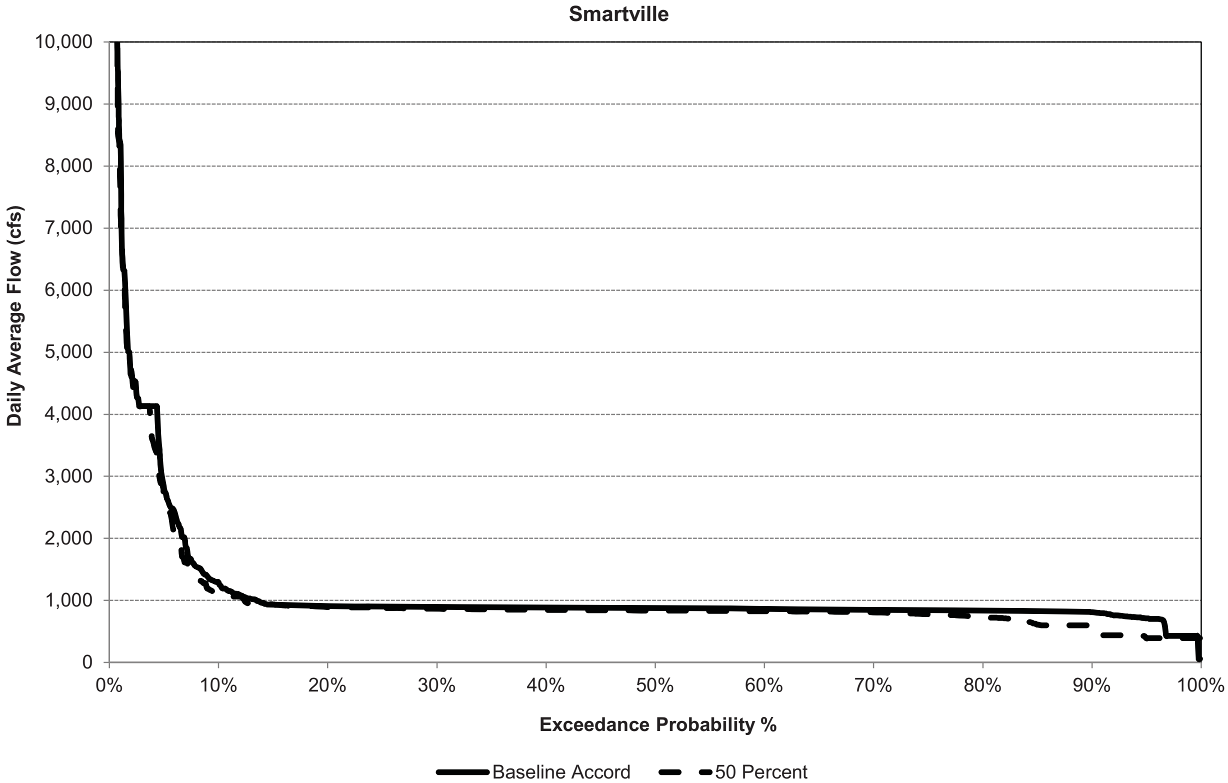
Smartville

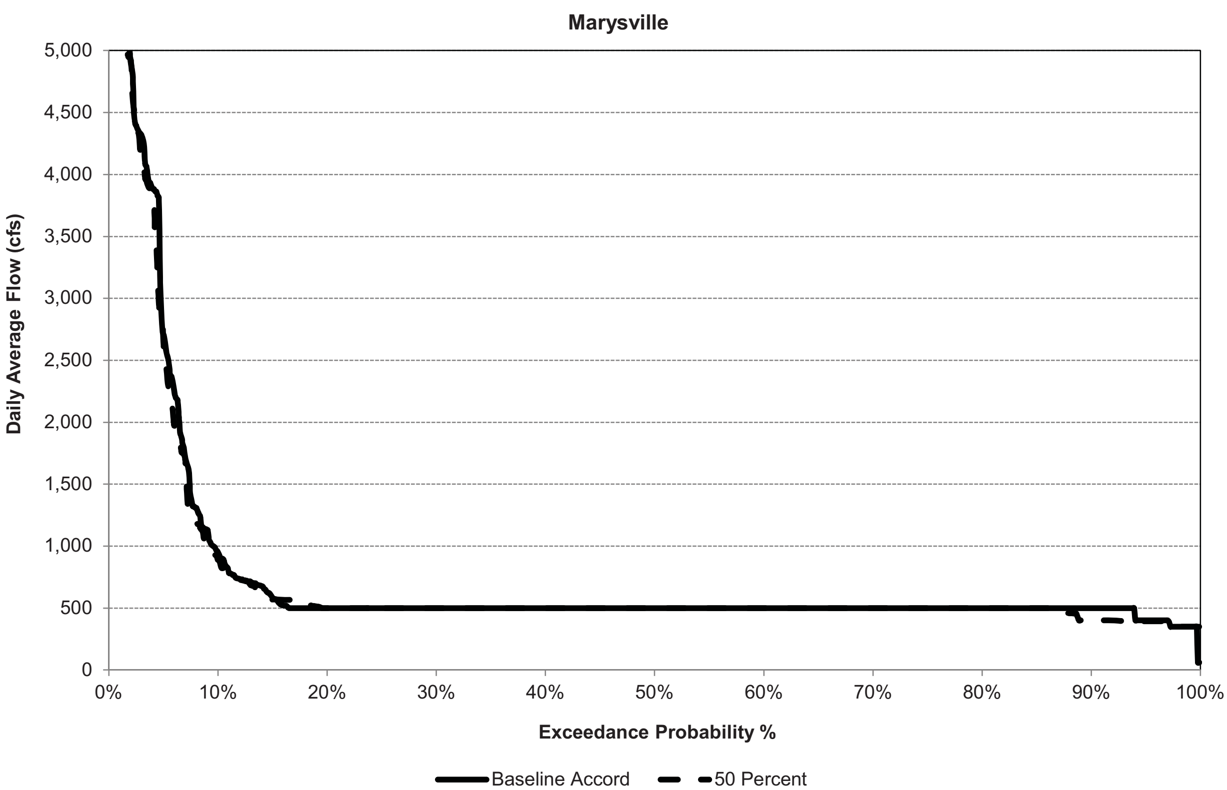


Marysville

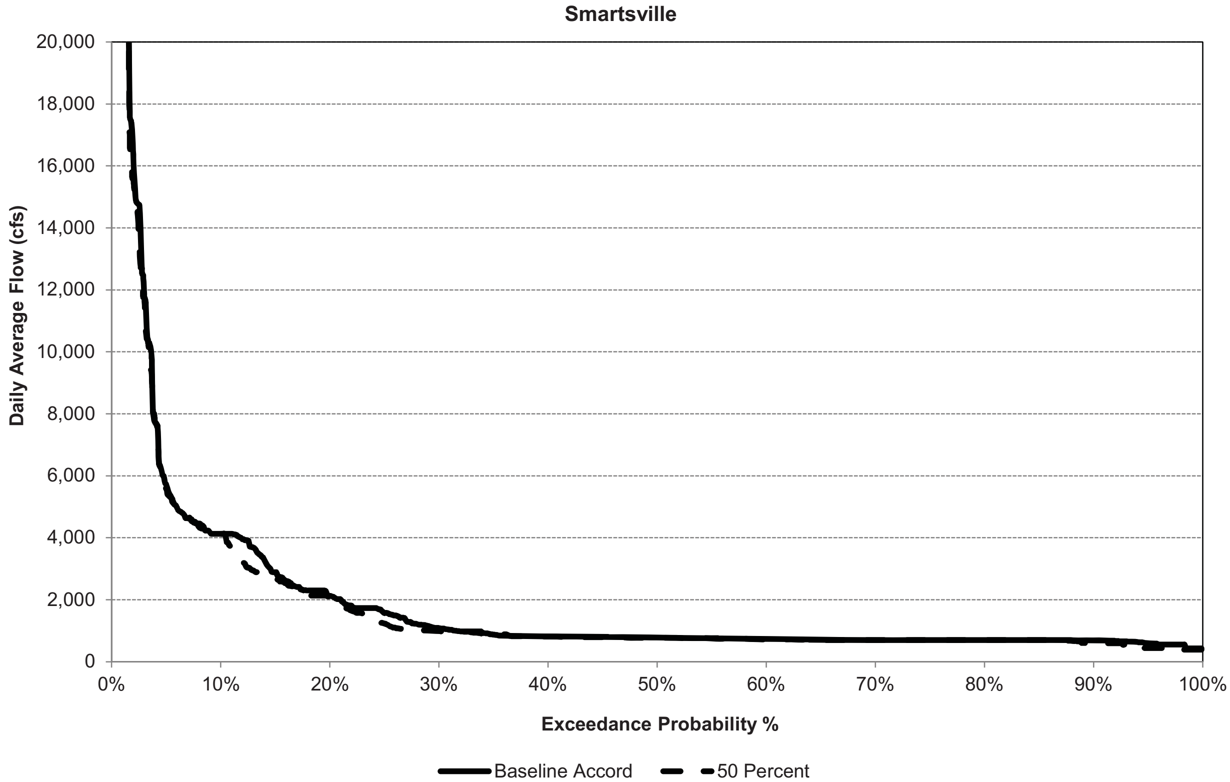


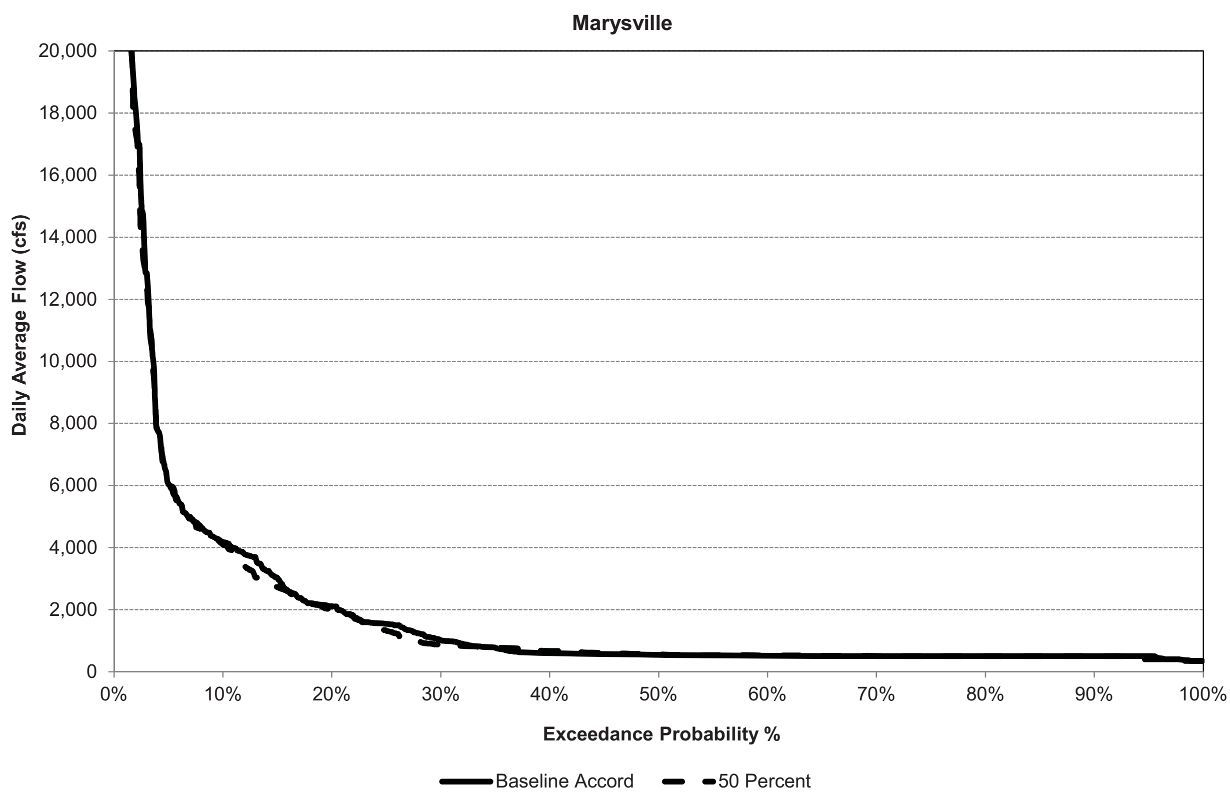
Exceedance Probability of Flow in November



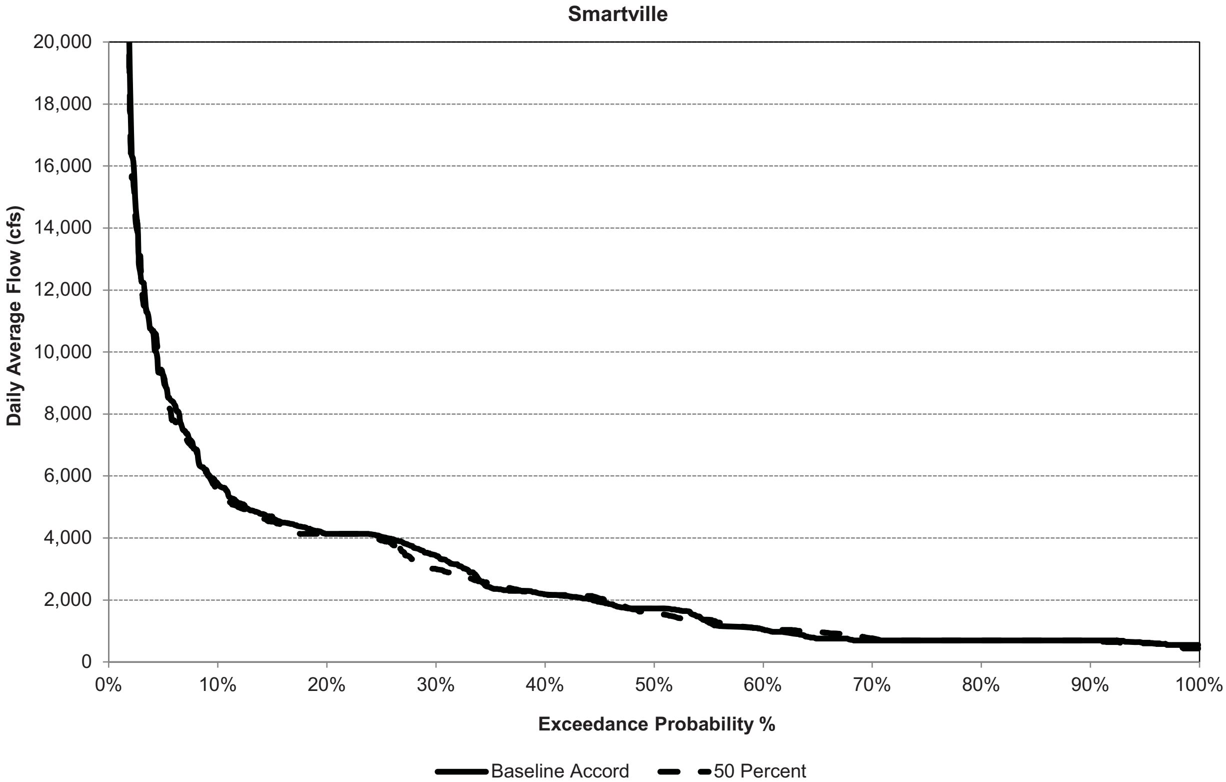


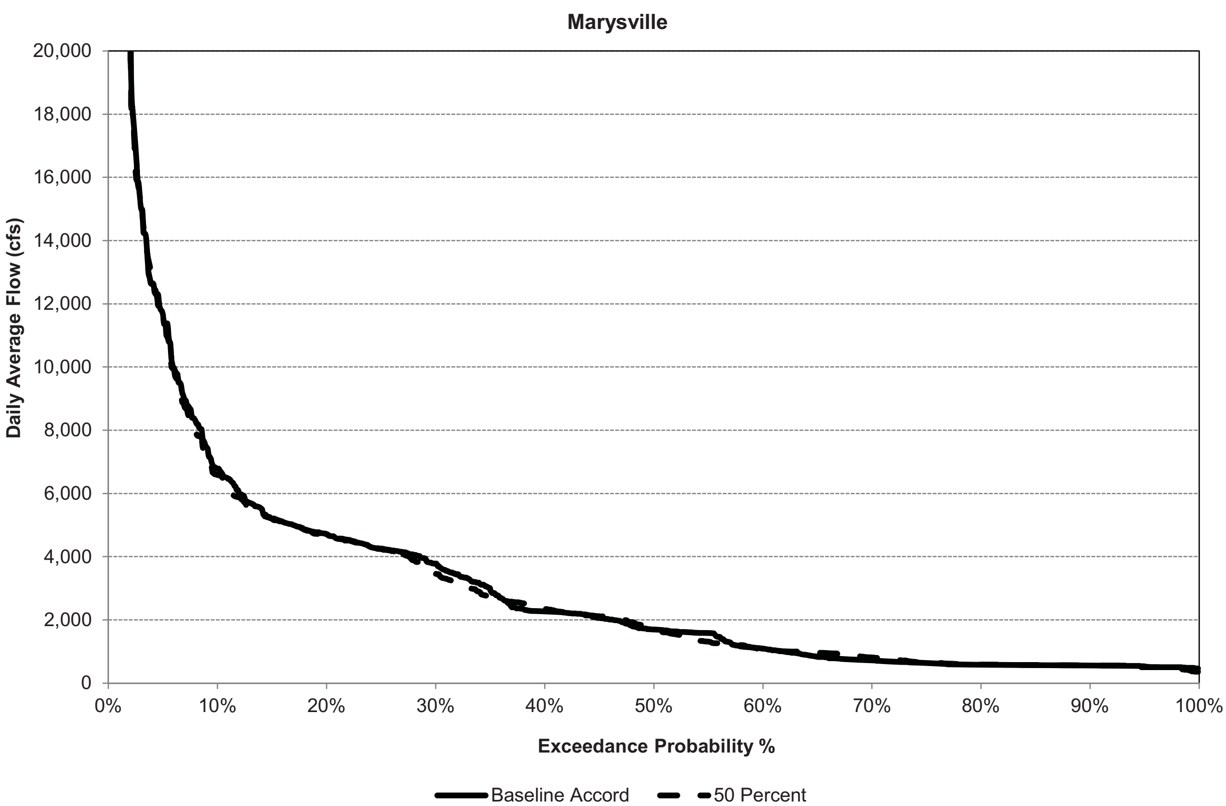
Exceedance Probability of Flow in December

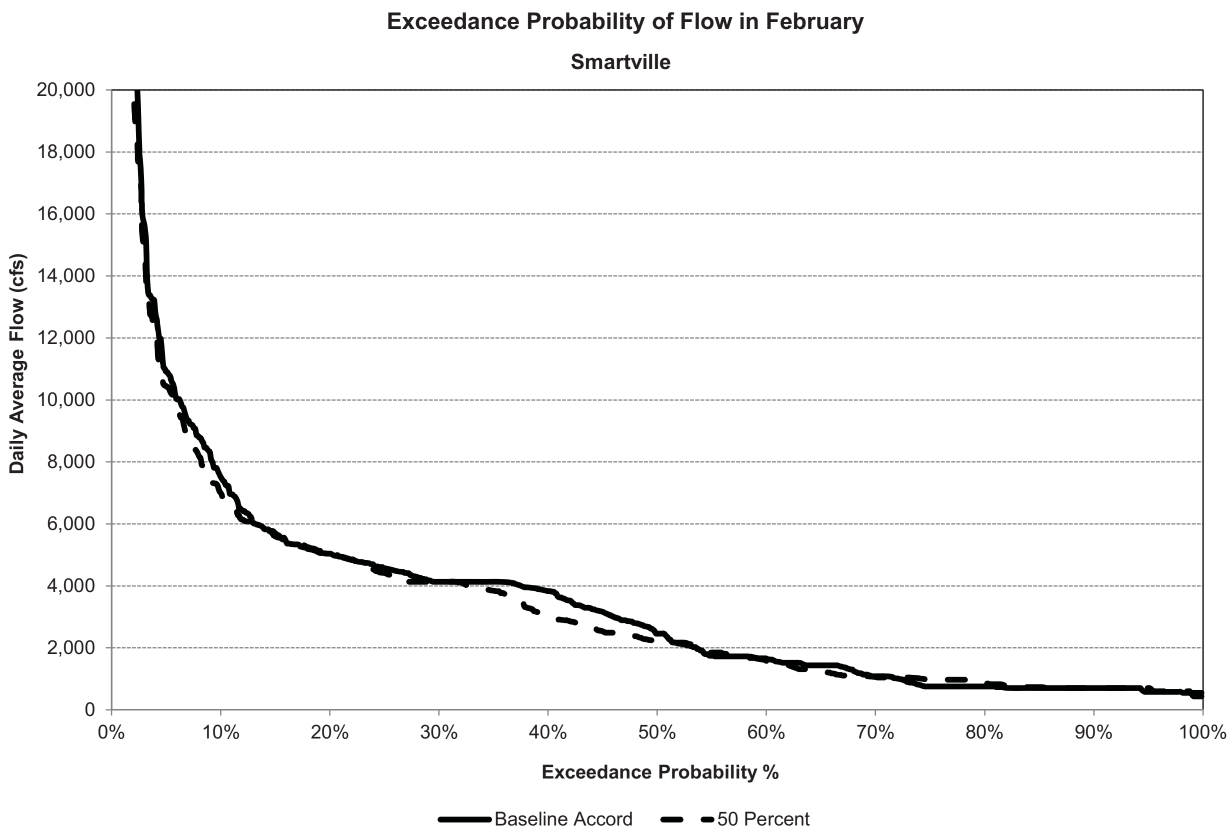


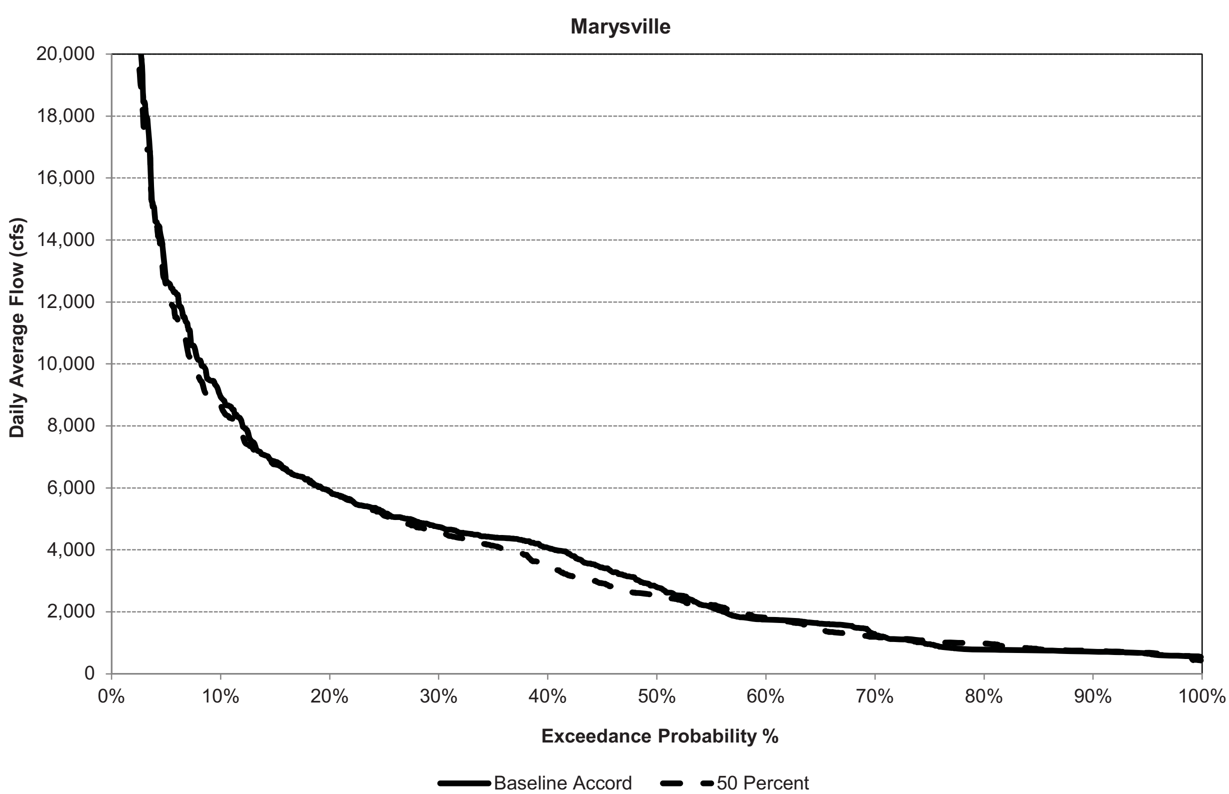


Exceedance Probability of Flow in January

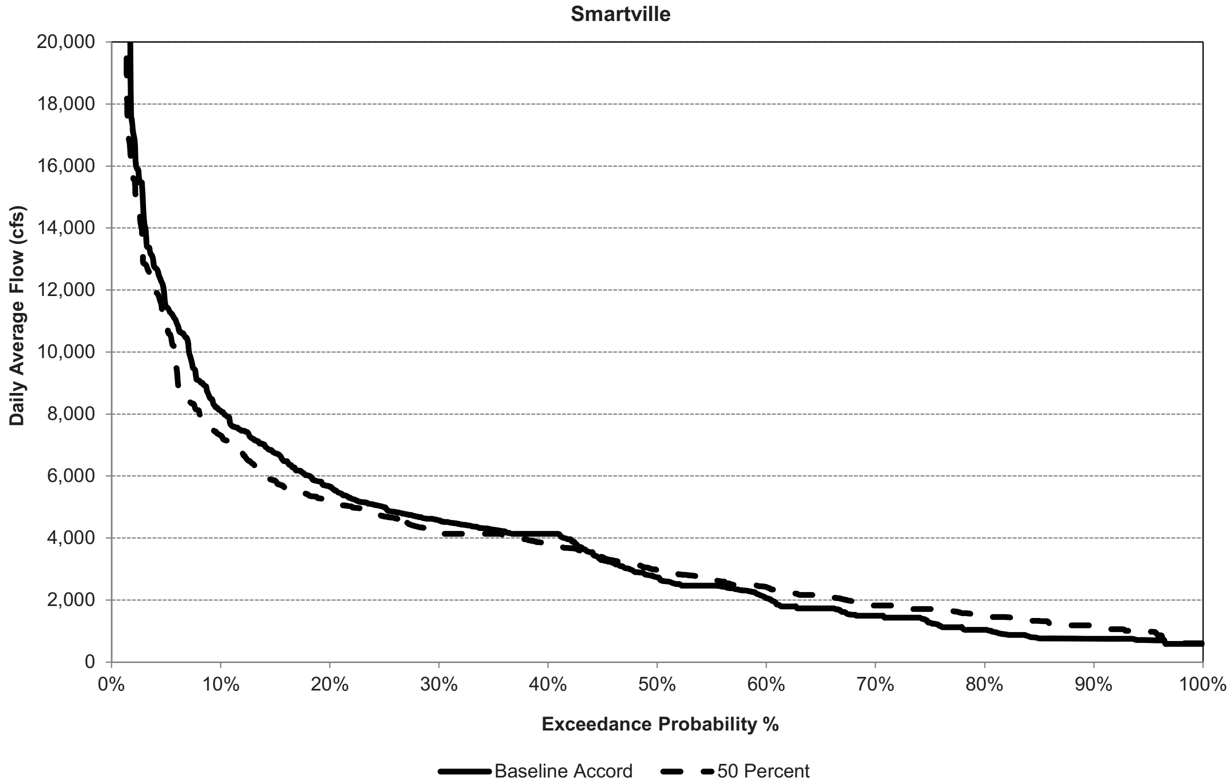


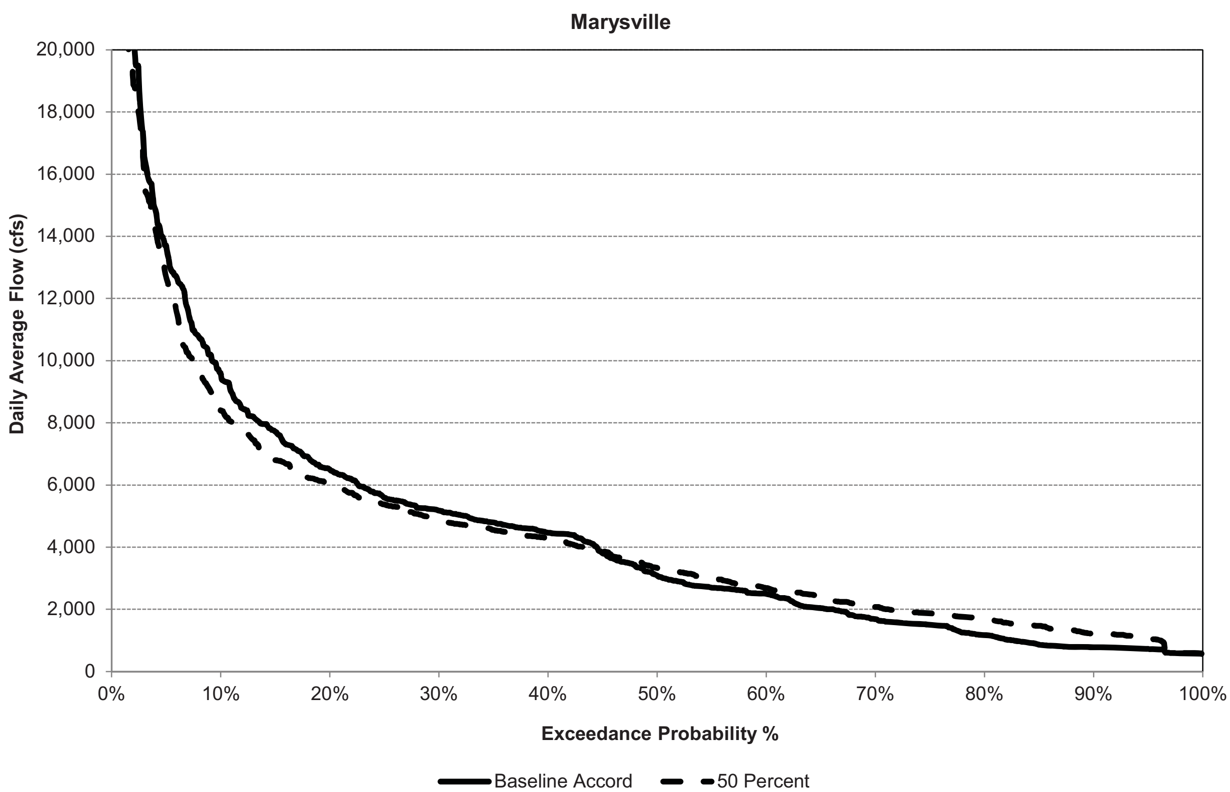


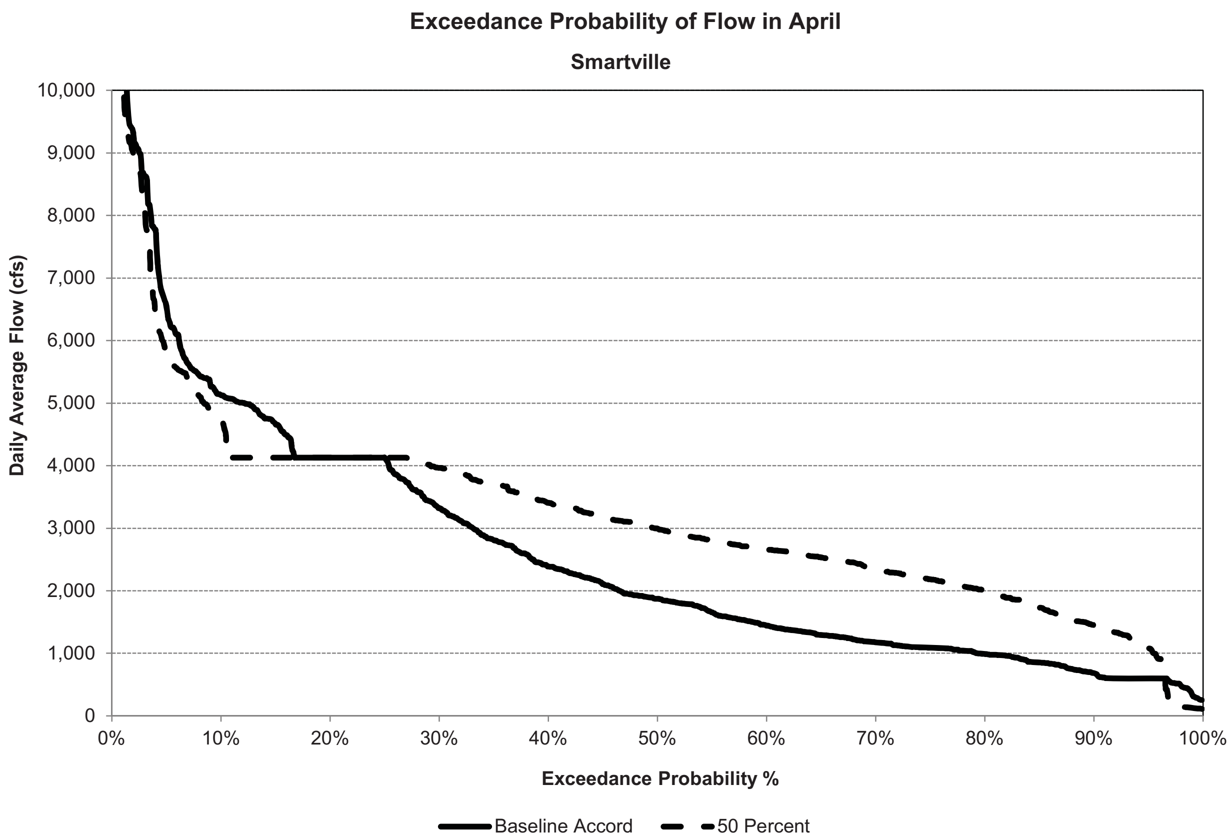

Exceedance Probability of Flow in February
Smartville
Daily Average Flow (cfs)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent

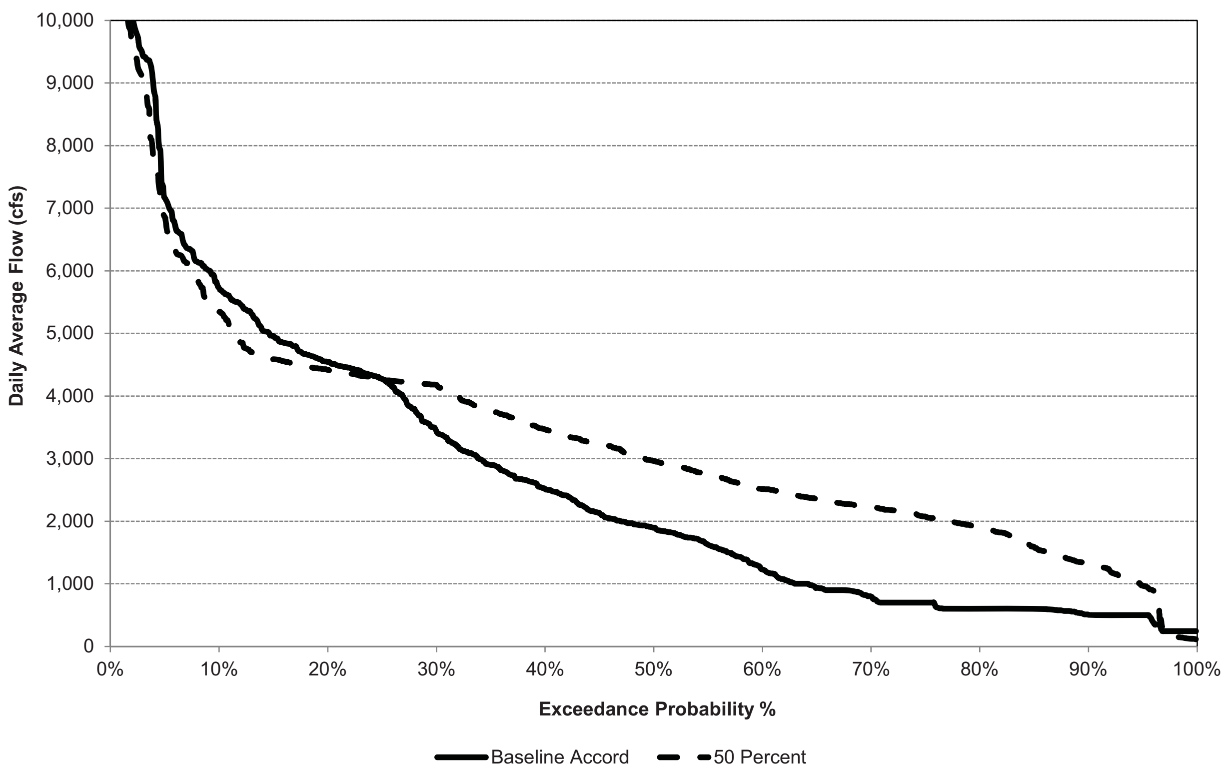

Marysville
Daily Average Flow (cfs)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent

Exceedance Probability of Flow in March

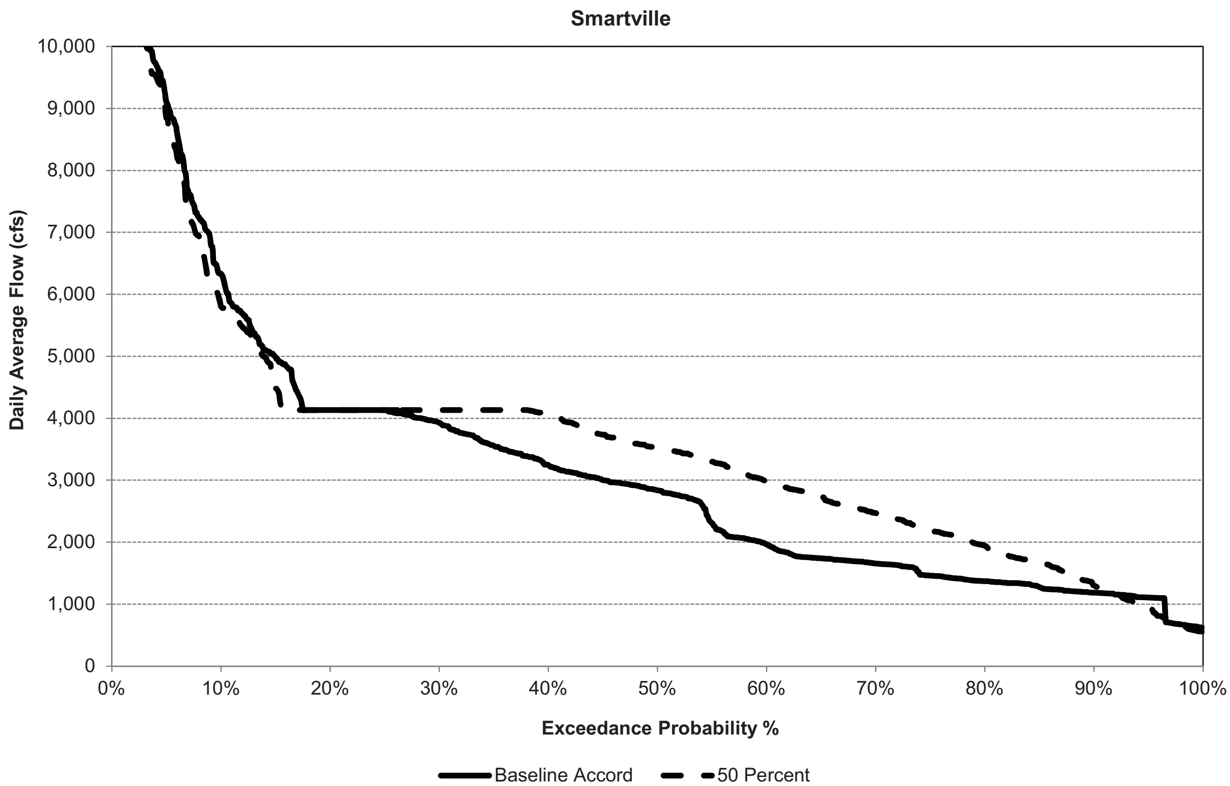


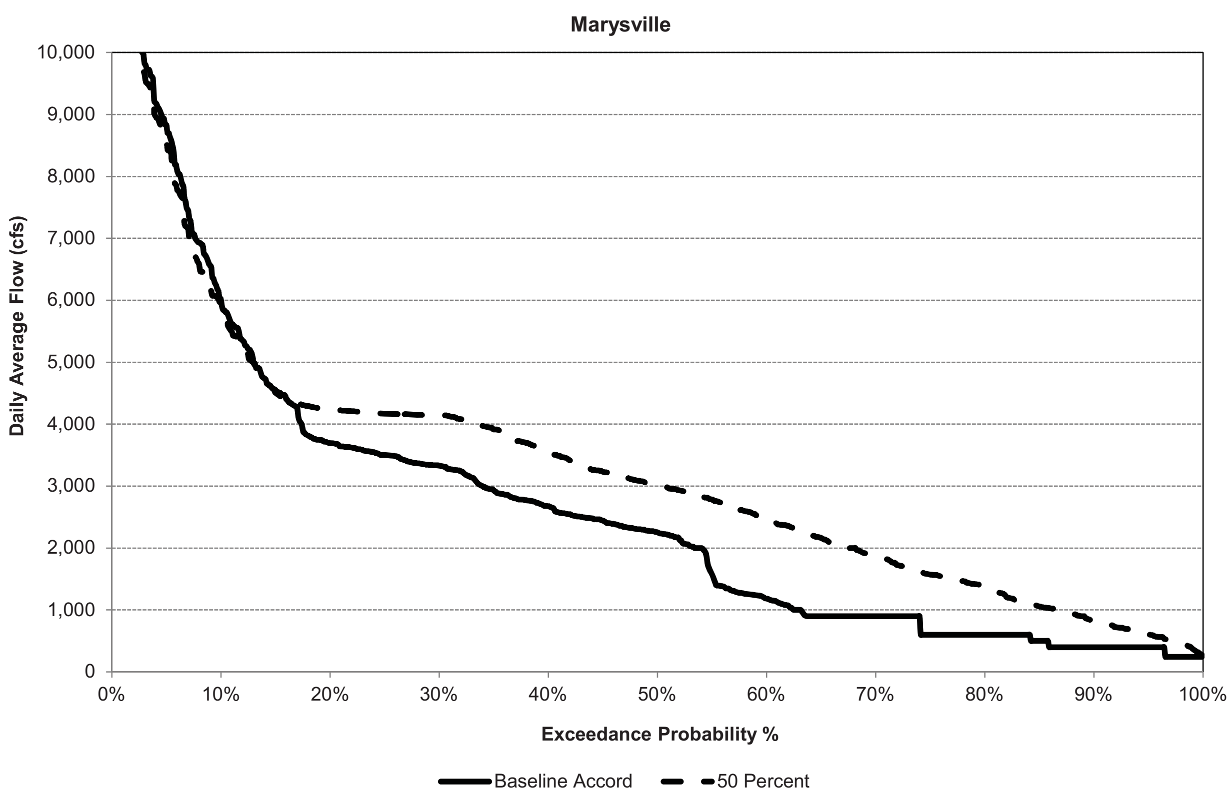



Exceedance Probability of Flow in April
Smartville
Daily Average Flow (cfs)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent

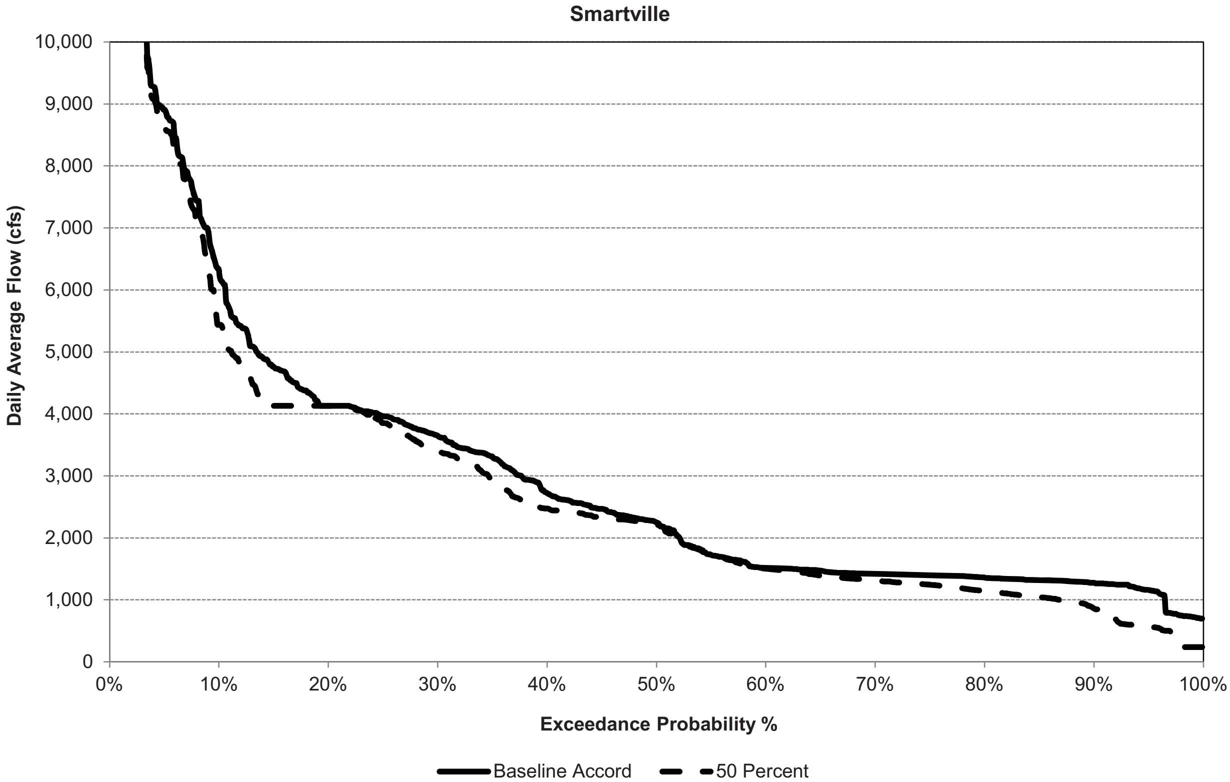

Daily Average Flow (cfs)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent

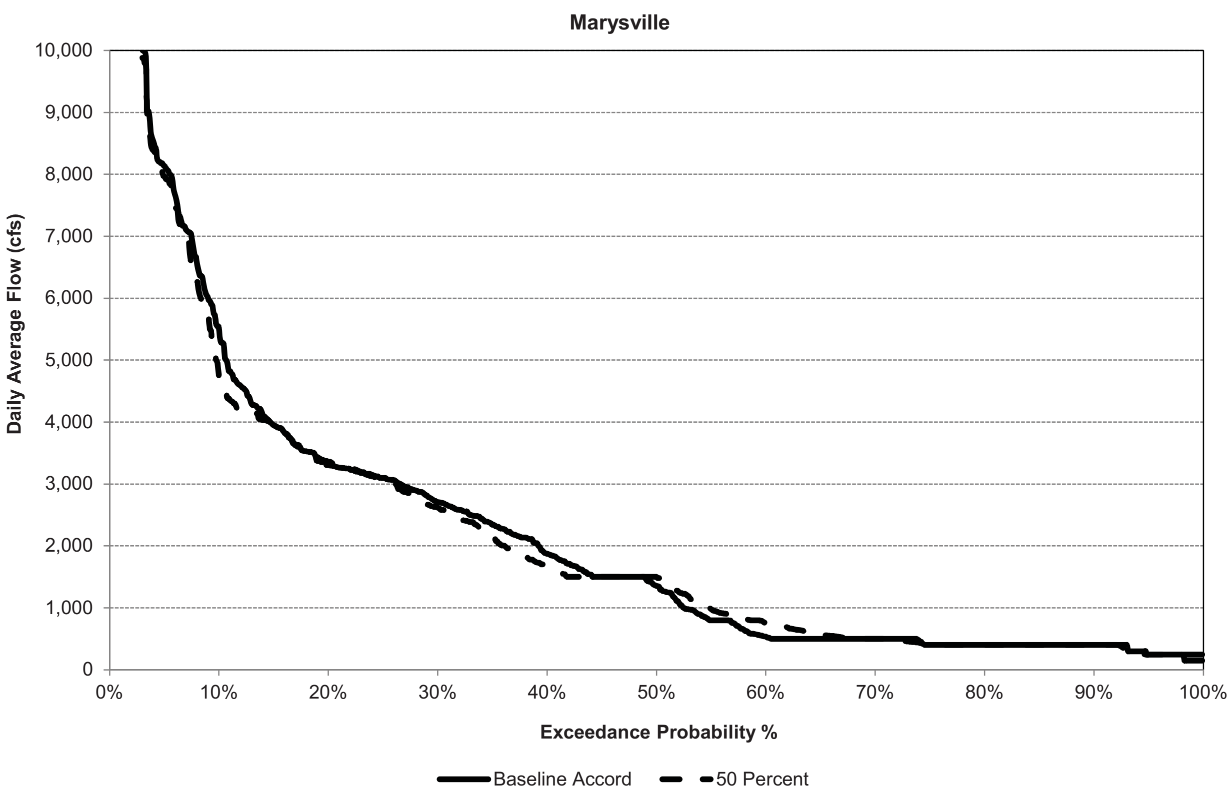
Exceedance Probability of Flow in May



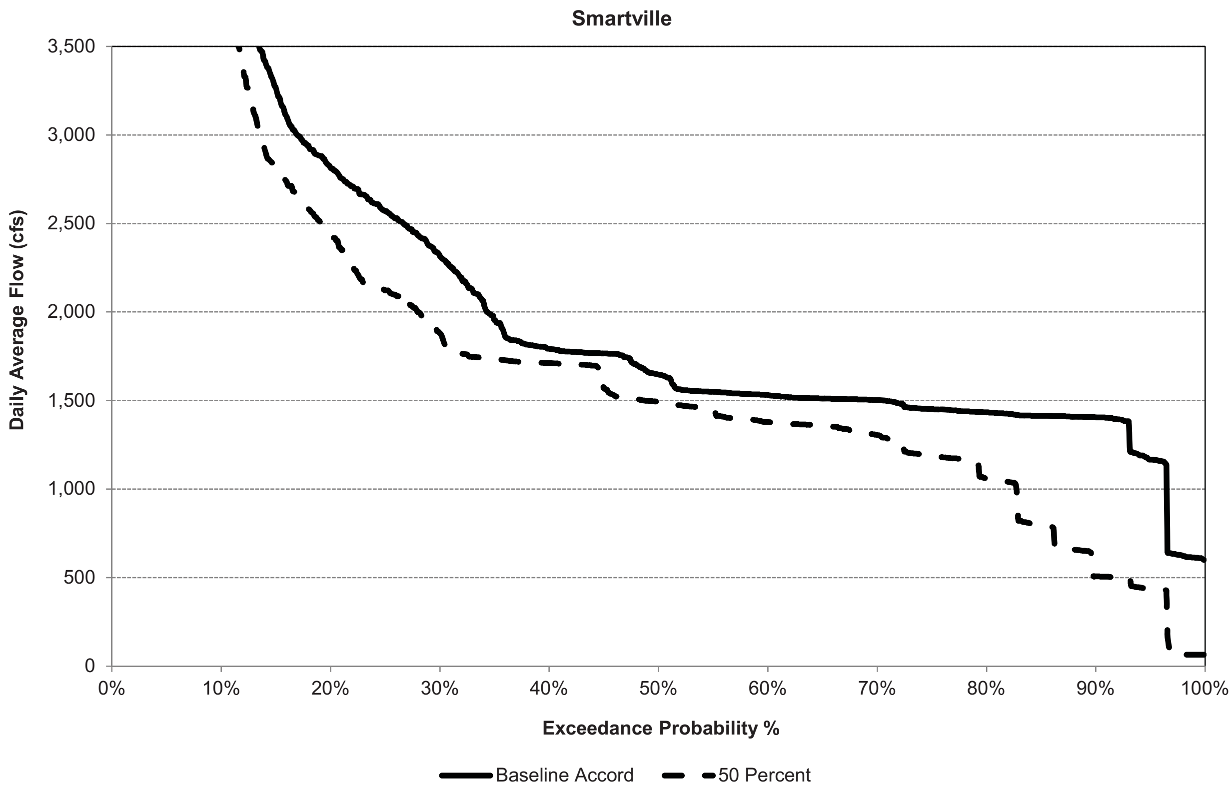


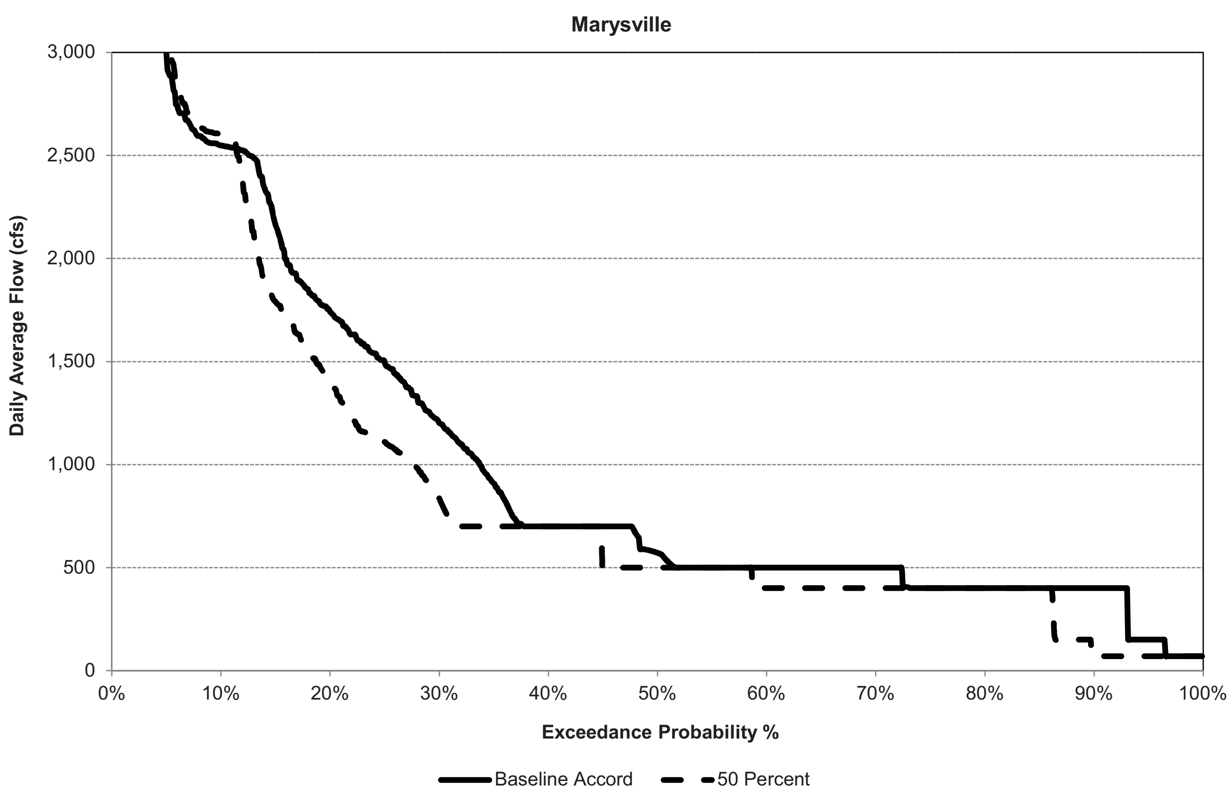
Exceedance Probability of Flow in June



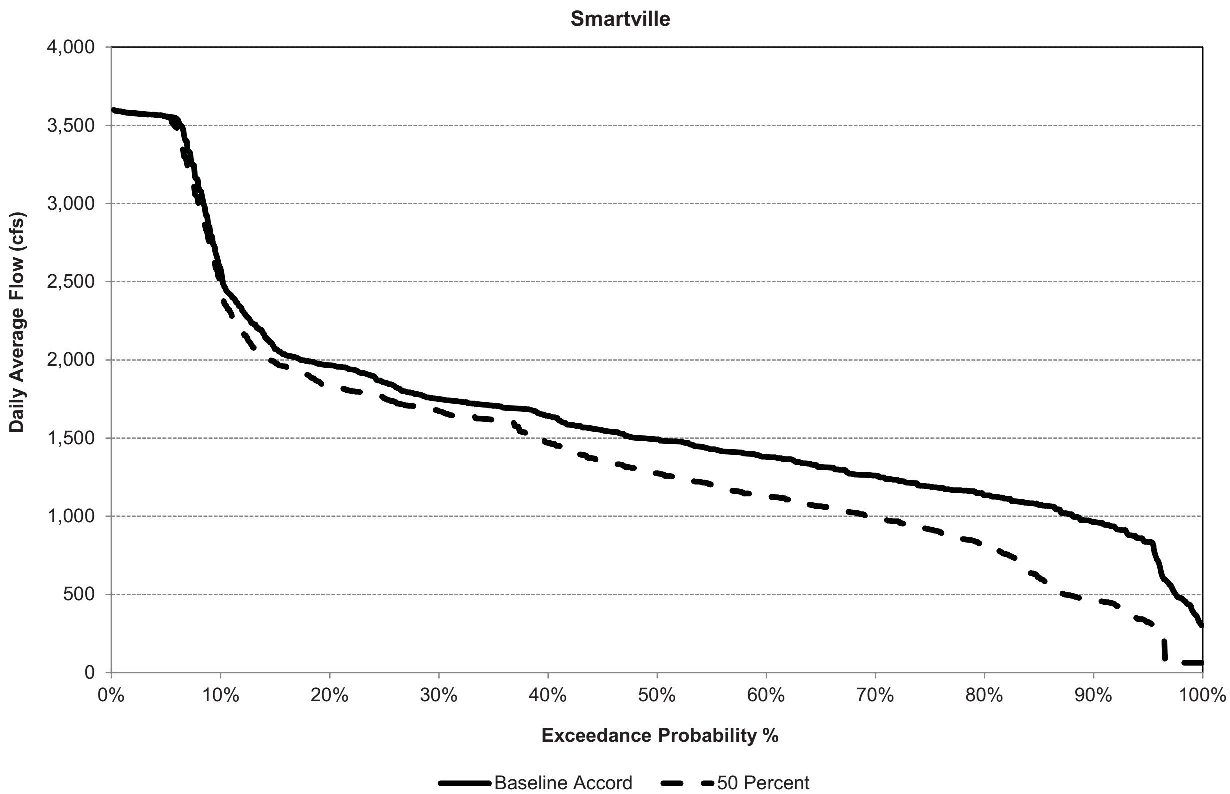


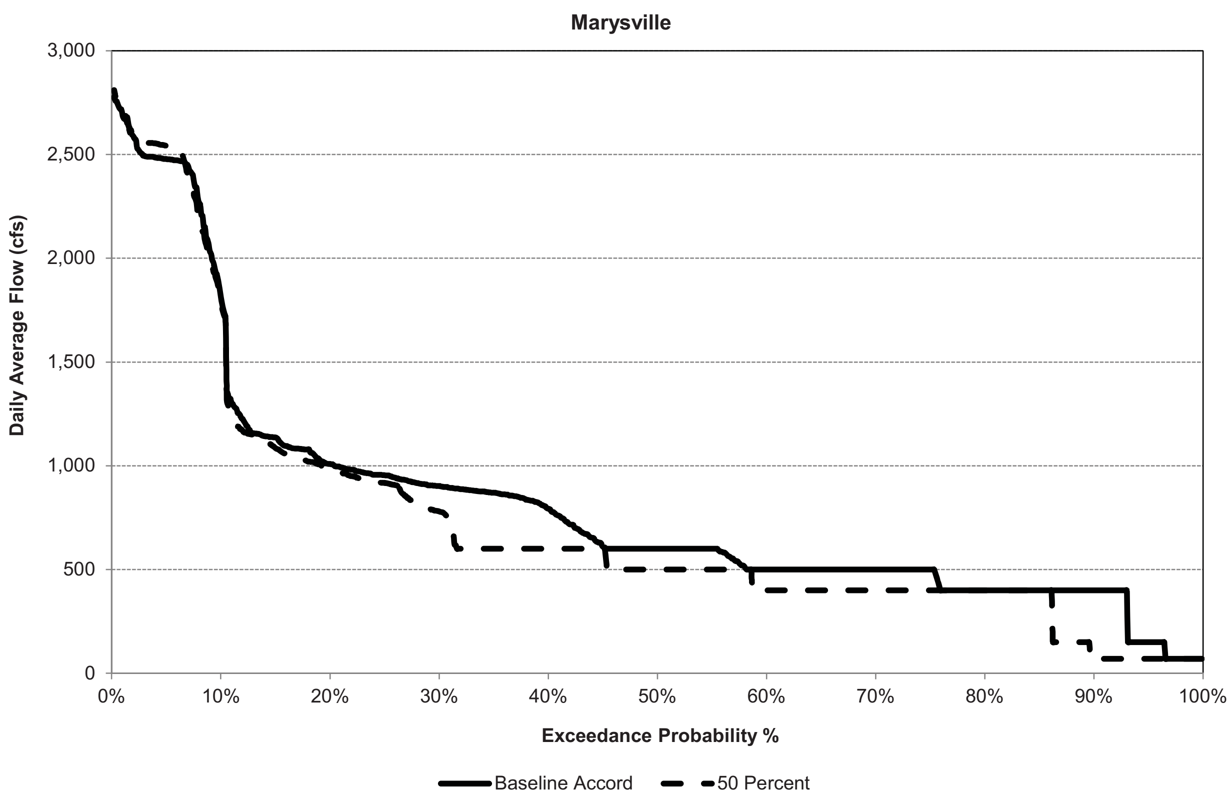
Exceedance Probability of Flow in July

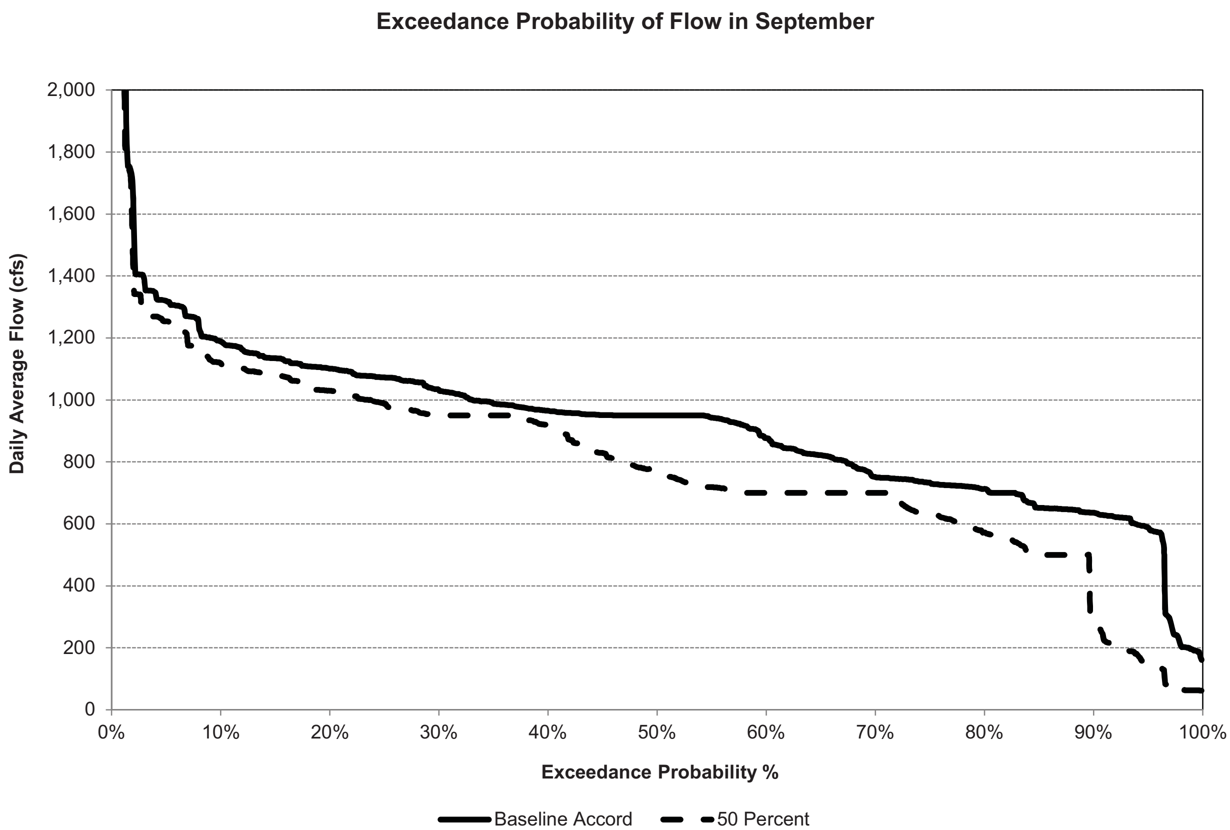


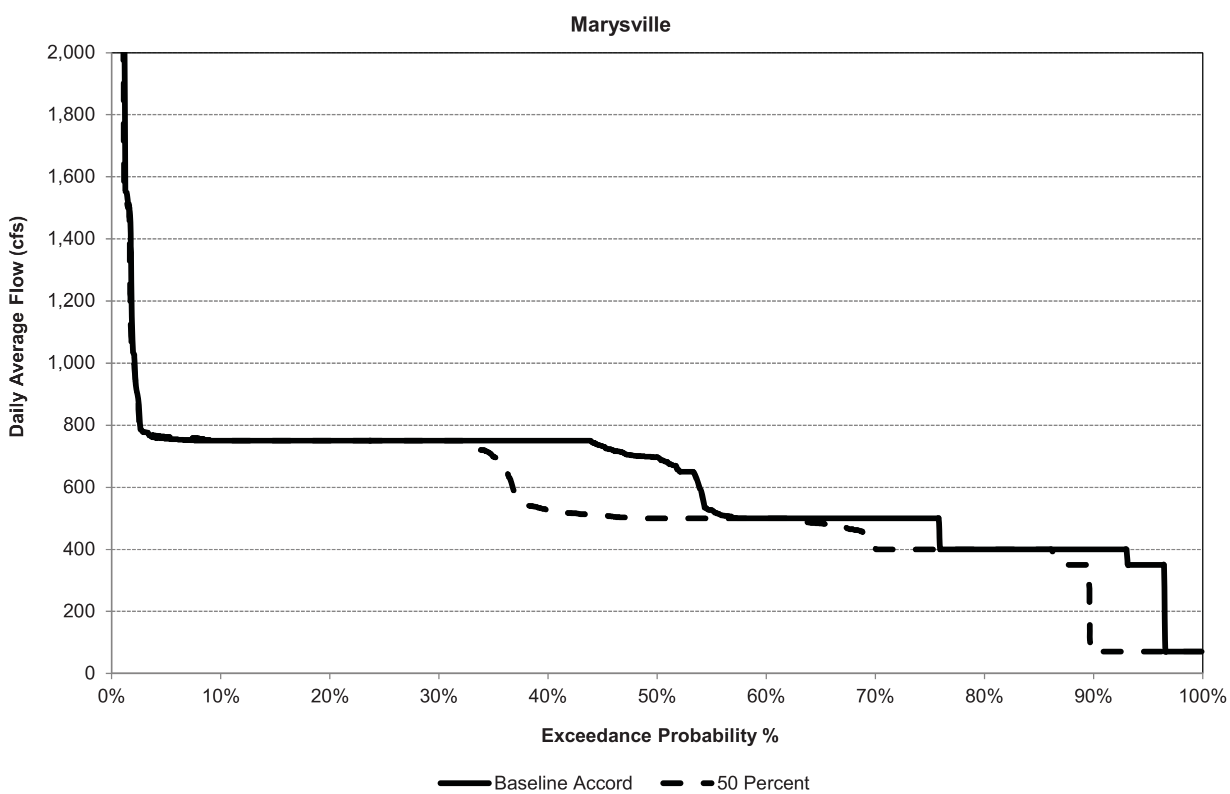


Exceedance Probability of Flow in August






Exceedance Probability of Flow in September
Daily Average Flow (cfs)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent


Marysville
Daily Average Flow (cfs)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance Probability %
Baseline Accord
50 Percent