SB 839 Matrix to Select Methods for Development of SVF Flow Prescriptions
Description and Implementation

Introduction

Senate Bill 839 (2013) established a Water Supply Development Account, in order to provide a public cost match to Oregonians seeking to develop water resources projects.

For water storage projects (above and below ground) ~~seeking~~ ~~both~~ that require a water right authorization and are seeking public funding under SB 839, the bill sets forth specific requirements. These requirements are triggered by water storage projects that are: impounding surface water on a perennial stream, or diverting from a stream supporting sensitive, threatened, or endangered (STE) fish species, or diverting more than 500 acre-feet of surface water annually. (Sect. 13(1)).

The bill specifies that for such storage projects, the state must determine whether seasonally varying flows (SVFs) have been established for the stream. If SVFs have not been established, the state must establish SVFs before awarding public funding. (Sect. 13(2)).

Seasonally Varying Flows (SVFs) – as defined in Senate Bill 839 – mean the duration, timing, frequency and volume of flows, identified for the purpose of determining conditions for a new or expanded storage project, that must remain instream[1]... in order to protect and maintain the biological, ecological and physical functions of the watershed downstream of the point of diversion, with due regard given to the need for balancing these functions against the need to store water for multiple purposes. (Sect. 1(2)).

More specifically, the functions that must be protected, according to the bill, include but are not limited to: stream channel development and maintenance; connectivity to floodplains; sediment transport and deposition; migration triggers for upstream movement of adult fish and downstream movement of fry and juvenile fish; fish spawning and incubation; juvenile fish rearing; and adult fish passage. (Sect. 19(4)).

The following narrative describes the methods the SVF Task Force recommends that the Water Resources Commission approve for the development of SVFs. The narrative focuses on the methods that will be used to develop~~ment of~~ a flow prescription that describes the necessary ~~floor flow, (i.e., ecological baseflow),~~

[1] The ellipses [...] refer to text removed at the recommendation of the task force. The phrase "outside of the official irrigation season" should be deleted. Instead, the methodology described here specifies that the approval process for these projects should rely on the Department's determination of "when water is available for storage" in order to be consistent with the methods the state uses to evaluate and permit water storage projects.

~~and the~~ duration, timing, frequency and volume of flows, including the necessary floor flow, (i.e., ecological baseflow), that must be protected instream to protect and maintain biological, ecological, and physical functions.

The fundamental drivers for choosing an appropriate SVF method are the attributes of the project relative to the attributes of the site, and how much information already exists about the proposed stream.[2]

Note that this approach responds to the economic feasibility realities noted in SB 839 (i.e., Many of the functional benefits to watersheds from water storage will not occur unless a new water storage project is financially feasible; and new water storage will not be appropriate or feasible in many locations).

It is important to note that before a flow prescription method is identified, the project will be scoped using standard OWRD storage application criteria and that all projects will adhere to existing rules and regulations (e.g Division 33). Every proposed project will be initiated using the standard, "Application for a Permit to Store Water in a Reservoir," and the "Application for a Permit to Use Surface Water." The applications include information about the storage project (e.g. source of water, dam height/composition, primary outlet works, etc.) and information about how the stored water will be used (e.g. source of water, water use, water management, etc.). The review of these applications will include an analysis of water availability and timing using the 50% exceedence criteria.

SB 839 Matrix: Determination of Flow Prescription Methods

If an SVF flow prescription is required for a proposed project, the next step is to determine the level of study that will be required to build an adequate flow prescription. A worksheet titled the "SB 839 Matrix" was compiled in order to transparently identify study methods for use in the SB 839 SVF prescription process. The SB 839 Matrix, supplemented by this narrative, describes the process used to identify which types of data collection and ~~study methods~~ analysis are recommended for a given project by considering the site and project characteristics. A variety of types of data collection and ~~information~~ analysis can be used to develop seasonally varying flow prescriptions~~, including desktop studies based on already-existing information, modeling, site visits, scientific expert workshops, and fieldwork~~.

The SB 839 Matrix lays out a series of questions within each Biological, Hydrological, and Hydraulic/Physical Processes Band related to the proposed project attributes, site attributes, and existing information. These bands are the basis for the development of a flow prescription and relate directly to the streamflow functions listed in the bill (Sect. 19(4)) (Table 1). Table 1 identifies

[2] As the proposed project increases in water requested relative to water available, risk to ecosystem functions, and complexity, so too will the level of detail necessary to develop a flow prescription. The level of effort required to create a flow prescription should correspond to how the project relates to its biological and physical setting.

the specific streamflow functions determined by analysis within each of the streamflow function bands.

Streamflow Function Bands	Streamflow Functions Listed in SB 839							
	stream channel development and maintenance	connectivity to floodplains	sediment transport and deposition	migration triggers for upstream movement of adult fish and	migration triggers for downstream movement of fry and juvenile fish	fish spawning and incubation	juvenile fish rearing	adult fish passage
Biological Band				x	x	x	x	x
Hydrological Band	x	x	x	x	x	x	x	x
Hydraulic / Physical Processes Band	x	x	x			x	x	x

Table 1. Comparison of streamflow functions listed in SB 839 and the streamflow function bands. The "X" under each streamflow function indicates which streamflow function bands will provide analysis or information for the streamflow needs of that function.

The "Key Questions," posed in the SB 839 Matrix will help determine what level of study is necessary to develop a flow prescription of the correct complexity. The following steps are used to implement the SB 839 Matrix:

Step 1) Begin to answer the Key Questions by starting with the column titled, "Questions to Discern Availability of Information." These questions are used to summarize available scientific data sets. "Sufficient" information means enough scientific information collected using standard biological, hydrologic, or hydraulic methods to develop the recommended flow prescription. Note that "sufficient" data Answers (Yes or No) to the following questions will help determine whether sufficient information already exists to develop an SVF flow prescription:

Biological Band :

① Is there sufficient information about species present at/below the point of diversion and their lifecycle needs?

Hydrological Band:

② Are there sufficient long-term data to understand the natural hydrograph?

③ Is there sufficient information to understand climate driven shifts to the flow regime?

④ Is there sufficient information about water availability?

Hydraulic / Physical Processes Band:

⑤ Are there habitat studies that provide sufficient information to understand the relationship between selected habitat features and streamflow?

⑥ Are there geomorphological studies or data that provide sufficient information to understand the relationship between sediment transport and streamflow?

⑦ Are sufficient stream data available to describe stream complexity and floodplain connectivity?
⑧ Are sufficient water quality data available, particularly related to temperature?

This scientific information collected using standard biological, hydrologic, or hydraulic methods may come from public, private, and non-profit sources and should meet appropriate quality assurance standards.

Step 2) Once each question has been answered Yes ("Y") or No("N"), move to the column titled, "Availability of Information Score." Here, mark for each Key Question whether the availability of information is sufficient or insufficient. If "Y" was circled in "Questions to Discern Availability of Information," then write "Sufficient." If "N" was circled, then write "Insufficient."

Step 3) Next move to the column titled, "Questions to Discern Impact of Project." These questions are intended to identify proposed project which are more likely to interfere with the biological, ecological, and physical functions protected by SB 839. There is a single question for each band (e.g., Key Questions 2,3, and 4 have the same Project Impact question), though the answer will be considered for each Key Question. Answers to the following questions will help determine whether the project is likely to have minimal or significant impacts at the project site and what level of effort should go into creating an SVF flow prescription[3]:

Biological Band:
① Is this project diverting from a stream with sensitive, threatened, or endangered species?

Hydrological Band:
② ③ ④ Is the project requesting an amount of water ≥ 50% exceedance analysis?

Hydraulic/Physical Processes Band:
⑤ ⑥ ⑦ ⑧ Is the impoundment located in-channel or in sensitive habitat? (Note that a "Y" answer to either part of this question qualifies as a "Y" answer to the entire question.)

Step 4) Once each question in the column "Questions to Discern Impact" has been answered Yes ("Y") or No("N"), move to the column titled, "Impact of Project Score." Here, mark for each Key Question if the impact of the project is either significant or minimal. If "Y" was circled in "Questions

[3] Scoping, must be done at the outset in collaboration with the technical review team, and at other decision points along the way, so that money and resources can be focused on projects that are going to be successful.

to Discern Impact," then write "Significant." If "N" was circled, then write "Minimal."

Step 5) Finally, move to the final column in the main matrix titled, "Resulting Key Question Scores." Here, combine the "Availability of Information Score" and the "Impact of Project Score" into a single box. For example, if for Key Question 4 the "Availability of Information Score" was "Sufficient" and the "Impact of Project Score" was "Minimal," the "Resulting Key Question Score" would be "Sufficient, Minimal." Each of the 8 "Key Questions" will have its own "Resulting Key Question Score."

Once a "Resulting Key Question Score" has been identified, the table to the right of the main matrix can be used to identify likely "Resulting SVF Study Methods." These methods consist of two categories: 1) Data Collection and 2) Analysis. Each category consists of a spectrum from simplest to most complicated and each method is inclusive of all simpler methods listed before it. A description of each of these "Key Question Scores" can be found in Table 2. The two Resulting SVF Study Methods Spectrums are as follows:

Data Collection (listed in order from simplest to most complicated; each entry is inclusive of all simpler methods):

a) *literature/expert review:* collection of information and data from existing scientific literature and opinions from science subject experts
b) *field visits (3-30 days):* collection of additional data; likely used to supplement existing data, though not enough for involved model development
c) *field work (1-6 months)*: collection of additional data; likely used to supplement existing data and may be enough to build/calibrate site specific models
d) *scientific expert workshop (6-12 months)*: a workshop consisting of scientific experts may be used to derive a best professional opinion relating data to streamflow functions and identifying additional data sources
e) *field investigation/study (1-3 years)*: a scientific study related to the monitoring and/or measurement of a flow function in order to determine the necessary flow prescription

Analysis (listed in order from simplest to most complicated; each entry is inclusive of all simpler methods):

f) *calculations*: application of basic analytical approaches; gives general understanding of flow function needs
g) *existing models*: utilization of existing models (e.g. PHABSIM) that may require inputs of field or other data
h) *scientific expert workshop*: peer-reviewed, group assessment of flow function needs and development of flow prescriptions
i) *develop models*: creation and utilization of a site or basin specific model

Resulting Key Question Score	Key Question Score Description	Resulting SVF Study Methods (see narrative Step 6 for details)
Sufficient, Minimal	Data are available and impact is limited. Simplest approach; minimal field visits and general analysis	**Data Collection**: Field visit, and/or literature/ expert review **Analysis:** Existing models and/or calculations
Insufficient, Minimal	Impact remains small, however data is unavailable. Additional site-based data collection is necessary, though analysis remains general.	**Data Collection:** Field work, field visit, and/or literature and expert review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations
Sufficient, Significant	Despite sufficient data, significance of impact requires careful review and analysis. Supplementary data collection and detailed analysis.	**Data Collection**: Field work, field visits, and/or literature review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations
Insufficient, Significant	Data is not available and the project will likely have a large impact on ecosystem functions. Most complicated approach; significant data collection and field work and detailed analysis.	**Data Collection**: Field investigations/study, scientific expert workshop, field work, field visits, and/or literature review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations

Table 2. This table is an expansion of the "Resulting Key Question Score" presented in the SB 839 Matrix. The additional column, "Key Questions Score Description," offers a simple description of the score and then describes the effort required to collect and assess the relevant scientific data.

With study methods identified, a flow prescription can be developed. OWRD, in consultation with the Oregon Department of Fish and Wildlife and affected Tribes, may approve the flow prescription or determine that water cannot be diverted from the channel in a method consistent with the language from SB 839. (Sect. 13(3)).