Exhibit DWR - 2

EVALUATION OF THE FEASIBILITY OF PROTECTING DOWNSTREAM MIGRANT CHINOOK SALMON SMOLTS IN THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER WITH PHYSICAL FACILITIES

A report prepared for the "Five Agency Chinook Salmon Committee for the D-1485 Hearing Process."

by the

"Fish Facilities Subcommittee"

of the

"Five Agency Delta Salmon Team"

July 15, 1991

This report was prepared for the "Five Agency Delta Salmon Team" of the "Five Agency Chinook Salmon Committee" for the D-1485 Hearing Process.

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SECTION A

SUMMARY AND RECOMMENDATIONS

The report summarizes the conclusions of a committee's evaluations regarding the feasibility, effectiveness and relative cost/benefit from fish protective facilities for outmigrant chinook salmon. None of the proposed solutions are amenable to implementation without significant additional investigations, due to the lack of site specific experience.

None of the solutions evaluated in this effort can meet the potential of a fish screen on an isolated conveyance facility. However, the fish protective facilities discussed in this report all have the potential to provide some improvement in the survival of outmigrant chinook salmon smolts.

This report does not reflect the views of any one individual or agency, rather, it is the consensus of a committee approach to the evaluation. As such, new innovative solutions which may have had a broad disparity of scores (views) did poorly in the evaluation, while those solutions for which we had been able to find a track record, did well, even though their overall score was average.

This report evaluates a series of sites in the Sacramento and San Joaquin River systems, with the following conclusions.

SACRAMENTO RIVER

o Sacramento River at Sutter (or Steamboat) Slough - A trapping facility should be investigated, and if feasible, should be designed to divert the chinook salmon outmigrants into the Sutter (or Steamboat) Slough complex. This alternative would eliminate the need for additional work further downstream, and would divert the fish around the area of concern at the Delta Cross-channel and Georgianna Slough complex.

o Delta Cross-channel and Georgianna Slough - The addition of a radial gate complex to the Georgianna Slough channel (with boat and adult migrant passage facilities), would appear to be the most cost effective solution to the problem.

The implementation of this solution would require the development of sufficient storage capacity south of this site in the export system to accomodate any significat level of curtailments. A new connection from the Sacramento River could resolve this problem, and is being considered as part of the North Delta Project being discussed by the Department of Water Resources.

SAN JOAQUIN RIVER

o Head of Old River - The installation of a radial gate at this site would eliminate the diversion of outmigrant chinook salmon smolts to the export pumps. This alternative would relatively inexpensive, and could reduce the impacts of the projects on chinook salmon from the San Joaquin River system.

o CVP and SWP Intake - The relocation of the existing fish screens (or the construction of new fish screens) ahead of an enlarged Clifton Court Forebay would appear to be the most reasonable solution. Such a project should incorporate both the CVP and SWP diversions, as well as the Contra Costa Canal in the design. The choice between the relocation of existing louver fish screens, and the construction of new "positive barrier" fish screens should be based on the desired chinook salmon screening efficiencies, and cost considerations.

SECTION B

INTRODUCTION

The State Water Resources Control Board hearings on the Sacramento-San Joaquin Estuary, which began in the spring of 1987 resulted in the formation of a Five Agency Technical Committee to evaluate the benefits and costs of the various means of improving the survival of chinook salmon during their emigration through the Sacramento-San Joaquin Estuary (Estuary), shown in Figure 1. Members of the Five Agency Technical Committee include the U.S. Bureau of Reclamation (USBR), Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the California Department's of Fish and Game (DFG) and Water Resources (DWR). This group is looking at a variety of means for providing protection for chinook salmon. These methods include:

a) operational measures such as flow augmentation, temperature control, and export curtailments, and

b) structural solutions including fish protective devices.

This report deals with one element of the task, an evaluation of the merits (including the costs and benefits) of installing fish protective devices at various sites in the Estuary to protect and enhance the survival of outmigrant chinook salmon. An isolated conveyance facility (the Peripheral Canal is one example) was used as the basis for the comparisons of the fish protective facilities discussed, since the basic design was well developed, and estimates of costs and benefits were readily available. This facility, while perhaps no longer viable politically, was designed to accommodate continued exports by the State Water Project (SWP) and the Central Valley Project (CVP) while providing for the restoration of "Historical Levels" of fish and wildlife in the Estuary. One of the principal goals incorporated into the design of an "isolated conveyance facility" was the protection and restoration of chinook salmon runs in the Sacramento and San Joaquin river systems.

From a fish and wildlife protection perspective, the design of any facility in the Estuary needed to address two basic issues. First, sufficient outflow must be provided to allow the Estuary to remain a productive environment, while allowing the anadromous fish to successfully migrate to and from their spawning grounds. Second, the direct effects of the current method of export had to be reduced or eliminated. It is these direct effects which were addressed by the design of the "isolated conveyance facility."

Insert Figure 1 here.

The main problems for fish and wildlife, associated with the current method of diversion, result from the following effects:

1) The transfer of water across the Sacramento-San Joaquin Delta (Delta), through the Delta Cross-channel, using the Mokelumne River, Old River and Middle River, results in a mixing of the Sacramento and San Joaquin River water, high flows in the central Delta channels, and the accumulation of small fish at the project intakes in the south Delta, where the existing fish screens are not very efficient for these small fish.

2) During many months, all of the San Joaquin River flow is diverted by the export pumps, and often Sacramento River water is drawn upstream in the lower San Joaquin River, causing a net flow reversal.

3) All fish salvaged at the project fish screens must be collected, handled and trucked back to release sites in the western Delta.

From a fish and wildlife protection standpoint the "isolated conveyance facility" would address these problems by:

1) Eliminating the cross-Delta diversion of water by replacing the present method of conveyance with an isolated channel. This in turn could allow the restoration of the central Delta as a nursery area for juvenile fish, and eliminated the mixing of the flows from the two river systems.

2) Restoring the direction of flow in the lower San Joaquin River, Middle River and Old River, and restoring normal tidal action to the central Delta channels.

3) Relocating the intake for the projects to the Sacramento River, reducing the diversion of the fish from their natural migration route, and allowing the construction of a fish screen such that the river would serve as a bypass for the fish screen. This would in turn eliminate the need to collect, handle and truck the fish.

4) Reducing the losses of small fish at the new intake, because it would be located above the main nursery area. Such a facility could make possible the reduction of these losses if the intake could be operated to shut down, or curtail, diversions as large pulses of small fish spawned upstream passed by.

The Peripheral Canal was used as the basis for comparison because it represents a facility which has been carefully evaluated, which could serve as the basis for comparison. The Peripheral Canal was to have been located on the Sacramento River, near the town of Hood, and was designed to accommodate diversions of about 18,000 cfs. These diversions were intended to meet the peak summer demands of the Central Valley and State Water projects. The total cost of the diversion facility was estimated to be $200,000,000 (1982 dollars), of which about half was the cost of the fish protective facilities. The specific details of the proposed fish protective facilities were summarized in the final report on that part of the program (Odenweller and Brown 1982).

The working group on fish facilities included Dan B. Odenweller, Barry Collins and Alan Pickard (DFG), Stephani Spaar, Jim Snow and Larry Smith (DWR), Steve Rainey (NMFS), Jim Goodwin (USBR), and George Eicher of Eicher Associates. A larger committee, which included Pete Chadwick (DFG), Marty Kjelson and Pat Brandes (USFWS), Roger Wolcott (NMFS), Randy Brown and Jerry Cox (DWR), Chuck Wagner (a private consultant on fish facilities), and Chuck Hanson of TENERA Corporation (now with Hansone Environmental) reviewed the efforts of the working group and this report.

The charge to the working group was to evaluate the feasibility of fish protective devices at several locations within the Estuary, and to estimate the costs and benefits of each of the selected alternatives. Alternatives to be considered included:

a) traditional fish screens,

b) flow diverters to keep outmigrants within or guide outmigrants into channels less subject to the effects of water diversion projects, thus improving their survival, and
c) trapping and trucking the outmigrants around the problem areas in the Estuary.

Since the goal was not some specific level of protection, but instead was to obtain some measure of improvement over existing conditions, all concepts which could provide a measure of protection were included in the first round of analysis. The larger group first met on Wednesday, August 3, 1988, to review the scope of the assignment, make assignments to the working group, and review the locations to be addressed and the concepts to be evaluated. From this first meeting came a consensus on the deletion of some types of screening technology, which were not considered to be well enough understood so that relative costs and benefits could be estimated. These are so noted in the descriptions in the next section of this report. Other decisions reached were:

1. We were concerned with Sacramento River flows of less than 25,000 cfs and San Joaquin River flows of less than 12,000 cfs. We assumed that if necessary, the structures could be deactivated or removed at higher flows.

2. The Delta Cross Channel and Georgiana Slough would be treated as a single problem area.

3. The DWR Delta Water Management Program planning needs would be considered, but would not limit our efforts.

4. We would limit our concerns to smolt (75-100 mm) chinook salmon outmigrants during April, May and June.

5. A trapping and transport program for outmigrants would be considered.

6. Only proven fish protective facilities would be considered, since there was a need to estimate benefits and costs.

The working group met again, on Thursday, October 6, 1988 to tour the sites under consideration. Participants on the field trip included Dan B. Odenweller and Barry Collins (DFG), Stephani Spaar and Larry Smith (DWR), Marty Kjelson (USFWS), Steve Rainey (NMFS), Jim Goodwin (USBR) and George Eicher (Eicher Associates). The next day, Friday, October 7, 1988, the working group met at the DWR Central District offices to review sites. Participants included Dan B. Odenweller, Barry Collins and Alan Pickard (DFG), Stephani Spaar, Larry Smith and Jim Snow (DWR), Roger Wolcott and Steve Rainey (NMFS), Marty Kjelson (USFWS), George Eicher (Eicher Associates) and Chuck Hanson (TENERA - Hanson Environmental now).

Subsequent to this meeting, participants were given the opportunity to evaluate the various technologies for each site, as described in Appendix B. Barry Collins then summarized the results and prepared correspondence, documenting the information. This summary highlighted some errors and inconsistencies in the evaluations, which were corrected where necessary, with input from each participant.

A draft report was then prepared, dated August 15, 1989. After the review and comment period for this draft report ended, a management decision was reached to have the report completed by Dan B. Odenweller, using the guidance provided by the committee, but without further meetings of the working group or the larger committee.

A second draft, incorporating the comments of the reviewers, and for the first time presenting conclusions for each site, was completed and dated February 28, 1990. This report summarized the input from the various reviewers and participants, but reached conclusions which should not be construed as representing the views of any member of the group, or of the group itself.

A final draft report, dated August 15, 1990, was reviewed by a smaller group which included Pete Chadwick, Marty Kjelson, Ken Lentz (USBR), Randy Brown and Roger Wolcott. The final report was then completed based on the input from this smaller group.

This report is the product of the meetings, and review by the participants. Reviewers of the document included both the working group and the full committee, as well as members of the Five Agency Technical Committee. In addition, input from several others was included. We wish to make it clear however that this report does not necessarily reflect the judgement of any individual or Agency, rather it is the collective opinion of the participants and the reviewers. The report is based in large part on the personal experience and judgement of the participants, and often depends on the extrapolation of information gathered in previous studies, often on other species, at other locations, for other purposes.

Additional work would have to be completed before any one of the potential options could be implemented. All of the concepts would require additional development and testing, and without this information the conclusions in this report should be viewed as general guidance, not as firm recommendations for physical solutions to the problem.

SECTION C

EVALUATION OF FACILITIES AND TECHNOLOGIES

Odenweller and Brown (1982) reviewed the literature relating to fish screening concepts which were considered for the proposed Peripheral Canal fish screen. This review, along with the results of subsequent studies form the basis for our evaluations in this section.

Predation problems associated with the alternatives must be considered. Increased salmon survival obtained by an option must not be offset by increased losses due to predation caused by the presence of the structure.

1. Behavioral Barriers

Behavioral devices depend on creating stimuli which cause fish to react in a desired, predictable manner.

a. As screens -

1) Louvers - These screens consist of vertically oriented slats, set at an angle to the flow which force the water to turn, creating a hydraulic disturbance at the face of the screen. Both the Central Valley Project and the State Water Project intakes are screened with these devices, and their costs, operational reliability and efficiencies are well known. A recent evaluation of the louvers installed at the Southern California Edison - San Onofre Nuclear Generating Station (Love, et. al. 1988) is available in addition to earlier work on the subject.

2) Submerged Traveling Screens - This type of screen extends only part way into the water column in a turbine intake at a hydroelectric project dam, and does not screen all the fish. Mechanical failures, fish impingement, debris accumulation and a lack of sufficient bypass flows have been major problems (Taft and Downing 1988). This concept was not considered any further.

3) Bar Racks - Coarse bar racks (trashracks) are standard features of many water intake systems, but racks (1-3 inch bar spacing) to block fish passage have not been extensively studied. It is possible, given the proper location, orientation

and hydraulic conditions, that bar racks could effectively operate as a behavioral barrier, preventing passage of fish which are physically small enough to pass through it, and thus serve as a cost-effective fish protection system (Taft and Downing 1988). This concept was not considered further, since any installation would have to have trashracks, and it resembles the louver, which is a more effective solution.

b. As deflectors

1) Sound - Findings from various studies investigating the use of sound to attract or repel fish indicate that fish quickly become accustomed to it, making sound ineffective for guidance. A literature review of sound and its effects on fish was made by Stahl (1975).

Preliminary tests in the Delta, by the Fish Facilities Program staff (in 1963 and 1964) showed some success for chinook salmon, but low success for striped bass. A large scale sound guidance test facility was built near Tracy and tested without success (Odenweller and Brown 1982). In light of this site specific information, and the lack of any other successful applications, this concept was abandoned from further consideration.

2) Electricity - Applegate, Marcy and Harris (1954) provided information on the effects of electrical fields on several species under a wide variety of conditions. Maxwell (1973) reviewed the literature concerning electrical screens and concluded they were not reliable enough for large scale applications.

Efforts to use electricity to screen fish had decreased in recent years, largely due safety considerations, its size selective nature and the demonstrated lack of effectiveness. A screening system for small fish may well be lethal to larger fish (Odenweller and Brown 1982). Electric barriers are now being manufactured by Smith Root, Inc., a company located in the Pacific northwest, but we are unaware of any new information which would change the conclusions reached earlier.

We are however currently in communication with Smith Root, and have presented them with the opportunity of working with us to demonstrate the feasibility of their system here in California.

3) Air Bubbles - Bubble screens or curtains have been at several power plant intakes to repel fish. Some success has been achieved for strongly schooling species such as alewives, but it appears less effective for solitary species such as striped bass (U.S. Environmental Protection Agency 1976). Bell (1973) found bubble screens to be ineffective for salmon. In light of these results, this concept was eliminated from further consideration.

4) Light - Johnson et. al. (1958) obtained variable results in efforts to use light as a means of guiding salmon. Allen and Rothfus (1976) reported that yearling coho salmon were attracted by mercury vapor lights. Strobe lights appeared to be effective in repelling alewives in clear water (Patrick 1981). A literature review on this subject can be found in Pagano and Smith (1977).

   In some situations artificial lighting may give predators an advantage over the prey which is being protected by the installation (Odenweller and Brown 1982). In light of the information available, this concept was dropped from further consideration.

5) Chains and Cables - Dangling chains and cables have been used in attempts to guide fish. Brett and Alderdice (1958) describe promising laboratory research on guiding sockeye and coho salmon, however field applications produced unsatisfactory results for juvenile fish (Brett and Groot 1963). As a result, this concept was dropped from further consideration.

6) Feeding Stations - This suggestion was based on an attraction theory, in which downstream migrants might be guided to a desired location. We have not found any information which would allow us to assess its merits or costs. In light of this, the concept was dropped from further consideration.

2. Positive Barriers

The concept for this screening system is to create a positive barrier which is designed to physically prevent fish from passing through the screen.

a. As screens

1) Fixed Plate Screens - Fixed screens can be designed in a variety of shapes and orientations. Some, such as the sawtooth design ("V"), incorporate guidance concepts which lead fish into a bypass. Fixed screens considered for this effort included the flat plate along a bank, either vertical or sloping, and a vertical screen in a sawtooth configuration. A horizontal flat plate set on an incline was also considered.

a) Plate Along One Bank - This design is desirable from an engineering standpoint in that structural complexity is minimized and maintenance access is relatively simple. Potential disadvantages of this screening system are the length of screen required to provide the low approach velocities needed to minimize impingement, the exposure of fish to the screen for long periods, and the accumulation of debris along the screen face. Placing the screen at an angle (sloping it from the toe back to the bank) would decrease the length of the screen.

b) Sawtooth - This configuration compresses the space needed for the screen and shortens the time any individual fish is exposed to the screen. Essentially, the screen is folded into a series of "vees," with a fish bypass at the apex of each "vee." The disadvantages of the system relate to the complexity of the bypass system (one is needed at the apex of each "V"), and the potential for smaller individual bypasses as a result of the larger number required.

c) Incline Plane Screen - This screen concept typically bypasses fish near the water surface. Small inclined screens (vertical rise of less than five feet) have been in operation for many years and results are often excellent for screening juvenile salmon when the velocity through the plate is less than 12.1 cm/s (0.4 ft/s) (Coots 1956). The ability of fish to climb an incline in excess of 6 m (20 ft), the rise required for the proposed Peripheral Canal intake has not been investigated, and in light of the fact that fish have difficulty adjusting to rapid changes in hydrostatic pressure (caused by rapid vertical changes in position), this concept was dropped from consideration for the project (Odenweller and

Brown 1982).

The inclined plane screen concept has been used to develop a high velocity (five to ten or more feet per second) pressure screen (the "Eicher" screen) for use in turbine intake penstocks in the Pacific Northwest. One small-scale facility presently uses this screen for salmonid outmigrants on the Willamette River, and another has been built near Elwha in the state of Washington. This second installation is being extensively evaluated with funding from the Electric Power Research Institute (EPRI). To date, the results have been encouraging (Winchell 1990), although the tests have been at lower velocities than originally advertised for the "Eicher" screen.

Another similar screen, located in front of a penstock and using lower approach velocities, is in place on the North Umpqua River (George Eicher, pers. com.).

Fishery agencies have shown reluctance to accept these designs, because of the relatively high velocities involved and the lack of adequate evaluations (Taft and Downing 1988). This latter concern may be addressed by the tests now being undertaken. Because of the uncertainties, this concept was dropped from further consideration.

2) Horizontal Drum Screens - These installations, which consist of a cylindrical screen lying with its longitudinal axis in a horizontal plane, have been used for many years. The rotary screen design must have the upper one-half to one-third of the drum height exposed to air, requires a relatively stable water surface, and the side and bottom seals require regular maintenance. The Glenn-Colusa fish screen, at the head of the Glenn-Colusa Irrigation District's intake near Hamilton City, and the new USBR Tehama-Colusa fish screens at the Red Bluff Diversion Dam are good examples of this screen configuration. This concept was eventually eliminated from further consideration because of the range of water surface elevations at the sites being considered.

3) Vertical Rotary Drum Screens - The vertical orientation reduces the seal problems associated with the horizontal configuration, and eliminates the need for a stable water surface, although new

cleaning problems arise. Examples of the rotary screen exist at Victor, on the Mokelumne River, and on the Russian River at the Sonoma Water District's intake.

4) Vertical Traveling Screens - The Royce Equipment Company and Envirex, Inc. both proposed a vertical traveling screen for the Peripheral Canal (Ecological Analysts 1981). The screen would have been 42 ft high with an equipment deck at 46 ft, 3 ft above the river bank, to assure the equipment is protected in the event of a flood. To screen a 22,300 cfs diversion, with low water at 17 ft and high water at 35 ft, 1500 ft of screen width would be required (150 units each 10 ft wide). This would have provided approach velocities ranging from 0.9 fps (at low water surface elevation) to 0.44 fps (at high water surface elevations). This concept was dropped from any further consideration because of its identified limitations, and the number of screens which would be required for the sites in question.

5) Cylinder Screens - Johnson V-slot screens were considered for the peripheral canal (Ecological Analysts 1981). This is a passive, positive approach relying on natural flows for self-cleaning. The concept for the Peripheral Canal called for many totally submerged cylinder screening units. The theoretical advantage over a long fixed plate screen is that, even though a fish may encounter several units, its exposure to the individual screen cylinder is limited by the reduced size of the screen. An estimated 3,000 units, each 3 ft in diameter and 3 ft long, were required for the 23,000 cfs Peripheral Canal diversion. With 8 ft diameter screens, about 350 units would have been required.

   Fixed horizontal drum screens (or cylinders) have also been used as fish protective devices. Examples include the Patterson Irrigation District fish screen on the San Joaquin River, and the Holland Tract screen installed by Bedford Properties as part of their Delta Islands Reservoir demonstration project.

   Fixed vertical screens have been installed near Red Bluff, on a low-head hydro project developed by Ott Engineers.

6) Filter Systems - A large scale sand filter concept was considered for the Peripheral Canal (DeVries 1973) with the intention of preventing eggs and larvae from being drawn into the diversion. Openings in the filter bed would have to be less than 0.5 mm to exclude eggs and larvae. The bed would have to allow sediment particles smaller than 0.05 mm to pass through to minimize clogging. According to the current theories of filtration, a 12 to 18 in. thick layer of uniform sand 1 to 2 mm in size would be required. The flow into the filter bed would be about 480 cfs/acre at about 0.01 ft/sec. To avoid movement of the filter material flow over the bed should be less than 4.5 fps, and a water depth of not less than 8 ft should be maintained to minimize algae growth. DeVries pointed out that additional information (studies) would be required to determine the feasibility of the filter concept. This concept was dropped from further consideration.

b. As deflectors -

Most of the screens discussed above could be used to deflect fish out of the main migration corridor into another channel. Clear exceptions are the cylinder screens and filter systems, with the applicability of the others dependent on the location and desired efficiency.

Field studies on the Columbia River have shown that the use of positive barriers as deflectors in turbine gatewell entrances can guide fish to a desired location. However, these deflectors have never achieved their theoretical efficiency, and hydroacoustic studies have demonstrated that downstream migrant salmonids will actively avoid the deflector, reducing its effectiveness, even at relatively high velocities.

3. Downstream Migrant Traps

Allen and Rothfus (1976) reported that a floating smolt collector utilizing induced attraction flows tested at Lake Merwin was able to capture 74 percent of the available juvenile coho salmon in the area. The efficiency of a riverine application of this kind of collection device, designed for a reservoir environment, has not been demonstrated on a large river, although small units are routinely used to trap outmigrants for marking purposes.

The two primary purposes for trapping juvenile salmonids in the northwest are:

1) enumeration, and

2) transportation around a reach of expected high mortality.

On the main-stem Columbia and Snake rivers, deep turbine intake screens divert fish in the upper water column into bypass systems, from which fish can be routed directly to the tailwater or to holding facilities, for eventual loading onto barges or trucks. Only the upper third or so of the 50 ft. deep turbine intakes is screened, and many juveniles (approximately 30% of the yearling and 70% of the zero-age chinook salmon) pass under these submerged traveling screens (STS's). Even when there is no spill, the STS's do not screen the entire project streamflow. The reasons for screening these fish are reduction of turbine related mortality and, to a lesser extent, sampling species number and composition data so that the entire outmigration can be monitored.

On tributaries, juvenile salmonids are trapped mainly to assess enhancement efforts in that basin. An example is the Prosser Diversion Dam on the Yakima River, where screens on the Chandler (irrigation and power) Canal, route fish into a sample building for enumeration. From these samples, the size of the outmigration can be determined with a fair degree of accuracy. At this site, the dam aids in directing fish toward the canal headworks. Only at very low flows can a large percentage of fish be collected. During higher flows, the bulk of the fish and flow are routed over the spillway.

There is a type of facility used on smaller streams in Washington, called a fan-trap, which screens the entire stream width. Approximately 500 cfs can be screened at these locations before these traps are flooded. This type of facility could not adapted to larger streams.

On the mid-Columbia, Douglas County Public Utility District looked seriously at screening the mouths of two tributaries as an alternative to providing expensive bypass facilities at Wells Dam. The idea was to collect, load, and transport outmigrants. During the outmigration, streamflows on these rivers exceed 3000 cfs. After analyzing the feasibility, it was decided that handling debris and fish during peak spring freshets would result in costly operations and maintenance programs, and would probably result in high injury rates. This alternative was subsequently dropped from consideration for this report.

On the whole, the only "successful" operations of this type are located at dams which block the entire flow of the stream, or on small streams where it is feasible to block the entire cross section of the channel. We do not believe that such a program will be effective on the Sacramento River.

4. Transportation

The only wild smolt salmon transportation programs with which we are familiar are the program on the main-stem Columbia and Snake river systems, and the fish salvage program at the Central Valley Project and State Water Project fish screens in the south Delta.

Pacific Northwest Experience -

Most Idaho and northeast Oregon steelhead smolts are collected at either Lower Granite or Little Goose Dams, which are the seventh and eighth main-stem dams as one moves upstream from the mouth of the Columbia. Both mid-Columbia and Snake smolts are collected at McNary Dam, which is the fourth dam upriver.

Research in the Pacific Northwest has shown that steelhead respond favorably to transportation, and have prospered under this program. The results for spring chinook salmon have shown the returns of marked, transported, fish to have been only slightly above the returns of marked control fish, released directly below the same project. The fish agencies and tribes have therefore requested the Corps of Engineers to spill water at the dams during the peak of the chinook salmon outmigration. This is possible because the Corps has the operational flexibility to pick up generation at other project dams during normal water years. Transportation of spring chinook salmon smolts is endorsed by the agencies and tribes only during dry years, when the Corps is reluctant to spill water for fish passage.

At McNary, the primary outmigration of fall chinook salmon from main-stem spawning areas just upstream occurs during a period of little or no spill. Trapping and transportation are usually maximized for these fish, although fish guidance efficiencies for these fish (75-125 mm) are low due to a more uniform vertical distribution. Handling losses are negligible except for periods when water temperatures exceed 20 degrees Centigrade.

Mortality and injury rates are monitored for each species at each project on the Columbia River system. The existing facilities have evolved based on continuous assessment of where in each system injuries or stress occur. Frequent design changes were made in early years; less frequent changes are made now. Mortality rates during the holding, handling and loading process run about 1-2%, but can be higher as water temperature and debris loading increase. Return rates of trucked fish are lower than for barged fish.

The transportation program is considered a success, although refinements will continue to be required at each collector project. The total yearly operations, maintenance, and assessment costs of the transport program are in the millions. This type of program could be employed on the Sacramento River system, but should not be entered into without a significant commitment to research and development. Experience in the Pacific northwest has shown that only if one lead agency is targeted, and long term funding provided is there a certainty that such a program can succeed.

Transportation from hatcheries has also been considered and researched. It has been concluded that returns from spring chinook salmon releases from remote tributary hatcheries have been negligible. Returns of fall chinook salmon directly to the newly constructed Lyons Ferry hatchery, on the lower Snake River are just commencing, and have not yielded a conclusion at this time as to whether transportation from this site will be worthwhile. It is believed results will be favorable.

Sacramento-San Joaquin Estuary Experience -

At the Central Valley Project and State Water Project screens in the south Delta, fish salvaged by the respective fish facilities are trucked to release sites in the western portion of the Delta. The trucking program is extensive, and involves the transportation of mixed loads of fish, of varying sizes, and has been recently evaluated (Raquel 1989). The results show that for the limited duration of the exposure in this program, the chinook salmon do quite well, with overall losses substantially less than ten percent. Ambient water temperatures appear to be the most significant limiting factor (Raquel 1989).

Limited information is available on the fate of these fish after they are released back into the system, in the western Delta. Experiments conducted by the Anadromous Fisheries Branch of DFG showed that mortalities of fish which had been exposed to the collection and handling system at the Tracy Fish Collection Facility had a survival of one half as compared to fish which were not subjected to the process (Menchen 1980), although the results were quite variable.

The trucking of fish from hatcheries and from trapping operations, both in the Pacific Northwest and here in California, has presented significant problems. Perhaps the most significant is the predation loss of the transported fish at the release site. These problems have been significant in California, and have caused us to make major changes in our operations to deal with the problems.

5. Barriers - Tidal Pumps

Barriers and tidal pumps have been proposed to solve site specific fish guidance and water quality problems at various locations in the Estuary.

Barriers, either solid or semi-permeable (rock or gravel), are intended to prevent fish from entering a channel or canal. Successful applications include the Old River Barrier (a temporary seasonal barrier), installed as needed at the head of Old River in the southern Delta. This semi-permeable rock barrier is used to direct flow down the main San Joaquin River past Stockton, to guide upstream migrant salmonids past the State and Federal pumping plants, and is removed before high winter flows (in late November).

Similar barriers (gabions) with finer sized material have been used on the Merced and Yuba rivers to guide outmigrant salmonids past small irrigation diversions. Clogging has been a continuing problem as fine materials and bio-fouling gradually reduce the permeability of the structures, which are permanent installations. The result has been the accidental (by high flows) or deliberate breaching of the gabion to permit the irrigation diversion to continue.

The use of inflatable barriers has been proposed, one such successful installation is located on the Russian River, where it is used to raise the head for a Rainey Collector system for a municipal water supply.

Tidal pumps have been suggested as a means of pumping water upstream in selected Delta channels, to meet agricultural water demands and to prevent downstream migrants from entering the channel. Tidally pumped water, in excess of the local agricultural demands would be allowed to move upstream in Old River, and then run downstream in the San Joaquin River, increasing flow in the San Joaquin River and guiding San Joaquin River outmigrants away from the pumping plants.

SECTION D

SITE DESCRIPTIONS

1. SITE MORPHOLOGY

Seven specific locations have been identified as either problem areas for survival of chinook salmon smolts within the Sacramento-San Joaquin Estuary or places where facilities could be provided to improve their survival (Figure 2). Information needed for facility planning and evaluations of each site includes data on the site morphology of each area. Information on width, depth, and channel cross sectional area was collected and summarized (Table 1). Appendix A has more detailed information on each of the sites. In some cases, little or no meaningful site specific information could be found for the area of concern.

The first sites, on the Sacramento River at either "I" Street or Freeport, were selected to represent the potential location of a trapping facility located below all major tributaries to the Sacramento River. The intent in this case is to trap and move the chinook salmon outmigrants around the Delta, either by truck, barge, or pipeline, to reduce losses. The location of both sites is shown in Appendix A - Figure 1. More detail of the Freeport area is available in Appendix A - Figure 2.

The next group of sites, one at the head of Sutter Slough and one at the head of Steamboat Slough on the Sacramento River (Appendix A - Figure 3), were selected because studies have suggested that chinook salmon outmigrants experienced better survival in these channels. We presume that by diverting the chinook salmon outmigrants into these channels and avoiding the Delta Cross-channel and Georgiana Slough, we could improve their survival.

The third group of sites, the Delta Cross-channel and Georgiana Slough on the Sacramento River (Appendix A - Figure 4), represent locations where known losses of outmigrant chinook salmon are occurring, and where a screen or closure would reduce or eliminate the loss. The Delta Cross-channel is presently equipped with radial gates which can be closed to eliminate losses associated with the diversions at the site. A similar solution for the Georgiana Slough, or fish screens at both sites, would keep the chinook salmon outmigrants in the Sacramento River, avoiding losses associated with the diversions at these sites. A significant consideration at these locations is the tidal effect, which influences flows through the channels. The normal effect of tide is compounded by a phase difference in the timing of tides between the Sacramento and the San Joaquin river systems, both of which are connected to this site. This results

Insert Figure 2 here.

Insert Table 1 here.

in a reverse flow at times, with water flowing from the central Delta into the Sacramento River.

The Three Mile Slough site on the Sacramento River (Appendix A - Figure 5) has a problem similar to that described for the Delta Cross-channel/Georgiana Slough complex. The major differences are the size of the channel and the magnitude of the tidal effects at this location, which is farther downstream (and thus closer to the ocean).

On the San Joaquin River side of the Delta, the basic problem is keeping the outmigrant chinook salmon in the San Joaquin River and out of the water being diverted to the intakes of the Central Valley Project and State Water Project. These sites are also under tidal influence, although the effects of the export pumping plants can override this effect at times.

The first site, the head of Old River (Appendix A - Figure 15), would keep chinook salmon outmigrants in the main San Joaquin River and away from the water going to the export pumps. A screen at this location could not prevent losses entirely, since additional sites downstream also feed water to the export pumps.

Further downstream, the mouth of Middle River and the mouth of Old River (Appendix A - Figure 18), provide avenues through which water is diverted to the export pumps. However, some evidence indicates that outmigrant chinook salmon are better able to avoid being diverted towards the export pumps, although the mechanism for this avoidance is not clearly understood.

Finally, the intakes to the Central Valley and State Water Project facilities in the south Delta (Appendix A - Figure 19) provide final opportunities for screening outmigrant salmonids before they are entrained. Both facilities presently have louver fish screens, which in the case of the State Water Project are downstream of Clifton Court Forebay, where substantial pre-screening losses have been documented. Consolidation of these intakes (and the smaller Contra Costa Canal intake), and new screens with a trapping and transport program may be appropriate here.

2. SITE HYDROLOGY

Hydrologic information for the six general problem areas identified (Figure 3) has been summarized in this section of the report. Figures 4a to 4c show the locations we have diagrammed with information on net Delta flows and tidal flows shown in the accompanying diagrams. In each case, the general inflow condition and the flow in each of the channels is shown. The range of flows shown in parentheses represents the effect of tidal action on the net flow. These data are the result of

Insert Figure 3 here.

Insert Figure 4a here.

Insert Figure 4b here.

Insert Figure 4c here.

simulations using the Department of Water Resources/RMA Delta Hydrodynamic Model. Three general inflow conditions were chosen for the Sacramento River, 10,000, 15,000 and 25,000 cfs, while San Joaquin River inflows of 1,800, 2,200 and 7,500 cfs were chosen for the simulations. Combined exports were set at approximately 6,000 cfs for the two facilities (SWP and CVP), to simulate conditions which would be prevalent during the time period for which we are being asked to develop facilities. Current operational constraints allow higher exports in April than are assumed here.

3. JUVENILE CHINOOK SALMON OCCURRENCE AND DISTRIBUTION

a. Sacramento River

1) Downstream Migration - Primarily occurs from April to July. During both 1973 and 1974 the abundance of salmon dropped off to almost nothing during the first two weeks of July (Schaffter 1980). Additional information is available in the USFWS testimony to the SWRCB (Exhibit 31) presented in 1987 (U.S. Fish and Wildlife Service 1987), and in the supporting annual progress reports.

2) Size Distribution

	Size Range (mm)		I Street Flow (cfs)	
	1973	1974	1973	1974
March	40-60	40's	51,000	64,000
April	60-80	40-50	21,000	66,000
May	80's	60-80	16,000	29,000
June	80's	80's	15,000	24,000
July	90's	90's	15,000	21,000

3) Vertical and Horizontal Distribution - Sampling with a mid-water trawl, conducted near Collinsville in 1970, during studies for the then proposed Pacific Gas and Electric Company Nuclear Power Plant, showed that juvenile chinook salmon were found primarily near the surface during daylight, while at night the fish were distributed evenly throughout the water column (Wickwire and Stevens 1971).

During the 1973 and 1974 Fish Facilities Program studies in the Sacramento River near Hood, vertical distribution sampling could not be conducted in the Sacramento River because of the heavy debris load;

however, some sampling was conducted with a mid-water trawl in the Delta Cross Channel and Georgiana Slough. During daylight 96% of the salmon were collected in the top two meters (25%) of the water column. At night salmon appeared to disperse throughout the water column; with only 11% collected in the top 25% of the water column (Schaffter 1980). Beach seine data tend to support this observation as catches along the shore dropped considerably after dark.

"Smolting" salmon (smolts) appear to concentrate in the higher velocity portions of the river near Hood. The highest catches were in the areas with the greatest flow (Schaffter 1980).

Based on sampling with a mid-water trawl in the Delta Cross Channel, Georgiana Slough, and the Sacramento River immediately upstream of these locations, Schaffter concluded that salmon were diverted into the Delta channels branching off the Sacramento River in proportion with the water diverted (i.e., salmon go with the flow).

More recently, a dramatically different picture of fish behavior, and thus distribution from day to night, was observed during a feasibility study for hydroacoustic techniques conducted in the lower Sacramento River, near Clarksburg and Hood, from June 1-5, 1982 (BioSonics 1982). Several interesting observations were made during this study. In general, the relative density of fish was greater toward the left bank (looking downstream) and higher at the Clarksburg site than the Hood site. More than twice as many fish were detected at night than during the day, and fish were also more active at night. The report concluded that the reason the fish observed during periods of great activity, were moving downstream, and were detected at night, was probably because fish were near the bottom and shore during the day (thus unavailable to sampling) and moved more toward the middle of the river at night. Studies to evaluate these results have been conducted in the last year, and are now being analyzed.

b. San Joaquin River

1) Downstream Migration - The fall run of chinook is the principal spawning run remaining in the San Joaquin River (SJR). Rearing and outmigration

occurs from November to June.

As juveniles increase in size (mid-January to mid-March) a density-dependent movement, similar to that on the Sacramento River occurs, dispersing fish throughout their rearing habitat. Dispersal downstream and into the Delta appears greatest when flows (sustained or spikes) exceed 1,000 to 2,000 cfs in the nursery tributaries during the December to March period. In 1986, over 400,000 fry were salvaged at the Tracy Fish Collecting Facility (CVP FF) and the John E. Skinner Delta Fish Protective Facility (SWP FF) in mid-February when a major storm resulted in tributary and mainstream discharge increases. Although the fate of prematurely dispersed fry into the Delta is unknown, DFG believes that losses are highest when water exports exceed inflow and flow reversals occur in the Delta (California Department of Fish and Game 1987).

The majority of the annual salmon production leaves the San Joaquin tributaries as smolts, with very few fish remaining beyond May 15, except during years with high stable spring flows (e.g., 1983). In years with dramatically fluctuating flows (e.g., 1985) most fish probably leave the tributaries by early April.

Conditions in the San Joaquin Delta are typically detrimental to smolt survival. This is largely attributed to low Delta inflow from the San Joaquin River, with diversions generally exceeding inflow during smolt migration periods (U.S. Fish and Wildlife Service 1987).

Fish salvage records from the CVP and SWP FF's indicate that smolt migrants primarily occur in the Delta from April to June, with numbers peaking in May (Figure 5). The differences in timing are the result of fish from both systems being salvaged at the fish facilities.

c. CVP and SWP Fish Salvage Analysis

1) Water Year Types - Five water year types were selected to demonstrate fish salvage based on the average May flow in the San Joaquin River past Vernalis and the average May total water export form the Delta. The year types range in condition from San Joaquin flows greatly exceeding exports

(1978 and 1982) to San Joaquin flows which are much less than exports (1976 and 1977). Two years of each type were chosen for analysis. The Delta

Insert Figure 5 here

Salmon Fish Facility Team was not concerned with protection for chinook salmon when flow rates in the SJR at Vernalis exceed 12,000 cfs, as described in the introduction.

Year	San Joaquin River (cfs)	Total Delta Exports (cfs)
1978	19,119	3,058
1982	18,654	5,994
1980	9,912	4,630
1986	8,763	5,360
1973	2,937	6,501
1974	4,106	7,130
1985	2,134	6,215
1987	2,177	5,313
1976	939	5,488
1977	400	2,987

2) Salvage Rates at the State and Federal Fish Facilities - The outmigration timing of juvenile salmon through the Delta may be reflected in their salvage rate at the SWP and CVP facilities. The salvage rate during the five water years listed above are provided in Table 2.

d. Size Distribution - The size distribution of juvenile salmon in the Delta may also be seen from relative length frequency histograms of the salmon salvaged at the SWP and CVP facilities. Length histograms from January to June at the SWP and CVP facilities are provided in Table 3. The table is based on data from 1978, 1980, 1982, 1985, 1986 and 1987. Data collected by the U.S. Fish and Wildlife Service at Chipps Island show a smaller mean size (U.S. Fish and Wildlife Service 1987).

Insert Table 2 here.

Insert Table 2 here.

Insert Table 2 here.

Insert Table 2 here.

Insert Table 3 here.

Insert Table 3 here.

SECTION E

SITE SPECIFIC STRUCTURAL OPTION EVALUATIONS

The following matrix was used to evaluate the various structural options to be considered at each of the sites of concern (Figure 6). Four categories of options were included for evaluation:

1. Traditional fish screens, either behavioral in their function or serving as positive barriers,

2. Structures intended to divert fish out of their normal migration routes while allowing water to flow through them,

3. Flow barriers which either completely block the flow or divert some portion of the total flow into a different path, and

4. Trapping devices which are either used in conjunction with a bypass return system or transportation.

SITE GROUPING

Each site was evaluated separately for each structural option.

The sites of concern were:

Sacramento River (SAC)

- Sutter Slough - Steamboat Slough
- Delta Cross Channel
- Georgiana Slough
- Three Mile Slough

San Joaquin River (SJR)

- Old River split at Mossdale
- Middle River / SJR junction
- Old R. / Mokelumne R. / SJR junction
- CVP Intake
- SWP Intake

STRUCTURAL OPTION DESCRIPTION

The type of structural options in the matrices were identified by codes. Up to three levels were used for the code to identify a particular structure; for example, S.B.L is the code used to

Insert Figure 6 here.

indicate a fish screen functioning as a behavioral device and it is a louver screen. The following is a description of the codes used:

1) Fish Screening Structures Intercepting all the Flow.

Traditional types of fish screens would span the entire river channel. These would create a hindrance to navigation, requiring boat passage facilities at most locations. Screens might also pose flood control problems if the associated structures, such as foundations, served as a restriction to flow. Negative impacts can also be expected on upstream migrating adult anadromous fish in some designs, and provisions to allow passage would have to be included.

TYPE	DESCRIPTION
S.B.L.	Louver behavioral fish screen.
S.P.P.	Perforated plate positive barrier fish screen.
S.P.D.	Rotary drum positive barrier fish screen.

2) Fish Diverting Structures Intercepting only part of the Flow.

a) Horizontal partial barriers extending all the way, or part of the way across the river, and hanging down from a surface structure would allow water to pass through, but discourage juvenile fish passage. This would probably be a behavioral device, such as a louver or trash rack, in order to restrict the size of the structure required and minimize flow interruption. The "TYPE" names listed below are revisions from those used in the initial rating exercise (Collins 1989), and were changed to reflect conventional terminology.

TYPE	DESCRIPTION
H.D.A.	Horizontal barrier extending all the way across the river channel.
H.D.L	Horizontal barrier extending part way across the river channel from the "left bank."
H.D.R.	Horizontal barrier extending part way across the river channel from the "right bank."

b) Vertical partial barriers rising vertically from the bottom to the surface. These barriers would extend out part way into the river from either bank, diverting flow and outmigrant fish into the side channel, but allowing water to pass through the structure.

TYPE	DESCRIPTION
V.D.L.	Vertical barrier extending part way across the river from the "left bank."
V.D.R.	Vertical barrier extending part way across the river from the "right bank."
B.W.	Wing wall and groin.

3) Flow Barriers.

TYPE	DESCRIPTION
B.G.	Radial gate.

4) Trapping Devices.

TYPE	DESCRIPTION
T.P.	Bypassing the trapped fish back into the river.
T.T.	Trucking the trapped fish below the impact area.
T.B.	Barging the trapped fish below the impact area.

EVALUATION CRITERIA

The working group agreed to rate each type of structure against ten criteria, on a scale of 0 to 10. A rating of 0 would represent the most undesirable condition, and a rating of 10 would represent the most desirable condition. This is a revision of the original approach used to rate these criteria in our earlier report (Collins 1989), and was made to minimize the confusion and facilitate comparisons among alternatives.

CRIT	DESCRIPTION
FEAS =	Feasibility of obtaining permits to build the structure. Ratings: 0 = Infeasible, 10 = No permit needed or the structure already exists.
BUILD =	Likelihood that the structure can actually be built. Ratings: 0 = Impossible, 10 = Very easy to build or already exists, needing only slight modifications.
FLOW =	Percentage of the flow in the river that the structure will intercept. Ratings: 0 = 0%, 10 = 100%.
NAV =	Impacts on navigation. Ratings: 0 = Blocks navigation, 10 = No effect.
EFF =	Screening or diverting efficiency of the structure

on chinook salmon smolts. Rating: 0 = 0%, 10 = 100%.

DNMIG = Screening or diverting efficiency on other downstream migrants. Ratings: 0 = 0%, 10 = 100%.

UPMIG = Impacts on upstream adult migrants. Ratings: 0 = Impassable, 10 = No effect.

PRED = Predation loss of smolts and other juvenile fish. Ratings: 0 = 100% loss, 10 = No loss.

CCOST = Construction cost index. Ratings: 0 = Most expensive, 10 = No cost.

OCOST = Operation and maintenance cost. Ratings: 0 = Most expensive, 10 = No cost.

SECTION F

COMPARISON OF ALTERNATIVES - RATINGS

INTRODUCTION

The ratings given to the evaluation criteria by the working group members were essentially identical among some of the sites. The ratings given for Steamboat Slough and Sutter Slough were identical as were those for the mouth's of Middle River and Mokelumne River. The ratings given for the Delta Cross Channel and Georgiana Slough are very similar, as were those for the intakes to the State Water Project and the Central Valley project. In these cases data from only one of the sites was used to represent both. The following sites were chosen for analysis:

1) STEAM for STEAM and SUTT
2) CROSS for CROSS and GEORG
3) THREE
4) MIDD for MIDD, OLD and MOKEL JUNCTION
5) OLD (Head of Old River)
6) SWP for SWP and CVP

METHODS

SELECTION PROCESS

The rotary drum screen was dropped from all consideration on the recommendation of Larry Smith and Jim Snow. They felt that the large tidal fluctuation and reversing flows at most locations would be impossible to work around.

A basis was established to select structures for consideration at each site based on the average ratings given to certain criteria. In order to be selected the average ratings for these criteria had to meet the values given below (Appendix B). NAV and UPMIG were not used as selection criteria. We concluded that it would be possible to include features in the design of a structure which would alleviate the adverse impacts to navigation and upstream adult migration.

FEAS = >3
BUILD = >3
EFF = >2
DNMIG = >2
PRED = >2

A "Benefit-Cost" rating index was then developed for each type of structure which indicates its relative suitability at each site. Four of the criteria (EFF, NAV, UPMIG, PRED) were chosen to represent the benefits of a structure. DNMIG was not chosen as a benefit because it is highly correlated with EFF. Two criteria (CCOST, OCOST) were chosen to represent the cost of a structure.The index was calculated by multiplying the mean benefit by the mean cost and dividing the resultant product by 10. Since both the benefit of a structure and the cost of a structure are based on a rating scale of 0 to 10, with 0 being the most undesirable condition (i.e., no benefit, extreme cost) and 10 the most desirable condition (i.e., 100% survival with no associated adverse impacts, minimal cost), the result is another criteria rated on a 0 to 10 scale. The following formula was used to calculate the index:

Index = ((EFF+NAV+UPMIG+PRED) /4)*(CCOST + OCOST)/2))/10

A basis was then established to select structures for consideration at each site based on their derived Benefit-Cost Index. In order to be selected, the structures' index had to be equal to or greater than 2. The structures recommended for consideration at each site are presented in Table 4, ranked by their "Benefit-Cost Index".

RESULTS

With the ratings from the working group in hand (Table 4), each site has been evaluated, and specific recommendations have been prepared, based in part on the evaluations. Based on limited site evaluations and available information, these recommendations were compiled by Dan B. Odenweller by incorporating the review comments of both those participating in the evaluations and those directing the preparation of the report. All recommendations will require significant additional work before they could be implemented. Sufficient information is simply not available to select, design or construct facilities of this scope without additional work.

SACRAMENTO RIVER SITES

Sacramento River Sites at "I" Street and Freeport

The Sacramento River sites at "I" Street and at Freeport have been proposed as the location for a trapping, collection and transportation program. These sites were chosen because they are downstream of all of the significant tributaries to the Sacramento River. These tributaries contribute large numbers of wild chinook salmon, and at times carry fish of hatchery origin as well.

Two sites further upstream have been proposed for such a program, the Red Bluff Diversion Dam/Tehama-Colusa Fish Facility complex

Insert Table 4 here.

Insert Table 4 here.

and the Glenn-Colusa Fish Screen at the intake of the Glenn-Colusa Irrigation District canal. Both of these sites are above both the Feather River and the American River, but would allow for the collection and transportation of wild chinook salmon from the upper Sacramento River. We will not consider these sites any further in this report.

The problem at the "I" Street and Freeport sites is to design a structure which will intercept, collect and transport a significant portion of the outmigrant chinook salmon, under the effects of tidal action, while providing a higher survival than in the existing situation. As we have described earlier, such programs exist in the Pacific northwest, but are either smaller in scope, or are associated with existing dams. We are unaware of any location where a facility of the size needed to deal with the Sacramento River has been constructed. The design of the facility would have to account for:

1) Navigational use of the river by both pleasure and commercial vessels.

2) Large debris loads including large trees and stumps.

3) Upstream and downstream migrants of a variety of species. An example is the upstream migrant striped bass and American shad which would pass the facility during the collection of outmigrant chinook salmon.

4) Potentially lethal water temperatures in the months of May and June.

5) The need to anchor some of the structures (at least the support piers) so they withstand winter flood flows.

The facility would not have to intercept the entire river cross-section to effectively intercept outmigrants. It would have to cover enough of the river to provide a net benefit to the fish after the structure related losses (due to predation and stress) were factored out. The five options of partial barriers across the river (excluding the wing wall and groin (B.W.) all have applicability at the "I" Street and Freeport sites. Of these, a floating vertical perforated plate curtain angled upstream, which guides fish into a trap, appears to be the most feasible. The facility could be mounted on barges anchored to pilings in the river. This would allow removal of the diverter when flows exceed some predetermined level, and allows for rapid installation of the facility as flows dropped. The structure would have to include a lock for boat traffic if it covered the whole river cross section. Such a structure could use trucks or barges to transport the fish, or could connect to the Sutter or Steamboat Slough channel, providing a natural bypass channel for the fish. Considering these issues, we conclude that it would be best to build the facility at the head of Sutter Slough, to minimize the costs and fish losses associated with the collection handling and transporting, or the bypass facilities.

While it may be feasible to construct and operate such a facility, we have significant reservations about the efficacy of such a program, and believe that significant research will be required before a structure of this type could be recommended. We are particularly concerned by the potential for large numbers of the target species to bypass the structure.

Sutter and Steamboat Slough Sites

The facilities constructed at this location would be designed to divert outmigrant chinook salmon into one or both of these channels, where limited studies have suggested that survival is better than those continuing down the main Sacramento River, while contending with tidal effects. We have not determined if either of these routes has a limit to its biological carrying capacity, and one potential outcome of a successful fish diversion program at these sites might be the loss of any projected gain, if the biological carrying capacity of the route were exceeded.

The diverter would not need to cover the entire cross-section of the river, but should divert enough of the chinook salmon outmigrants to produce a net benefit to the fishery.

The ratings from the working group resulted in five choices for these sites, in two groups.

The highest rated choice, a behavioral groin or wing wall (B.W.) would be designed to guide outmigrant salmonids into one or both of the channels. Depending on the site specific requirements and hydraulic modeling of the river, the barrier could be built on the same side of the river ("right bank") below the head of the side channel, to guide fish into the channel, or the barrier could be built on the opposite side of the river ("left bank"), above the side channel, to guide the outmigrants across the river to the desired location. Such a barrier would increase the amount of water diverted into each of the side channels, which in turn would improve the carrying capacity of the channel for fish. The cost would be that water would not be available for diversion at the Delta Cross-channel. A permanent structure could obstruct the flood channel of the Sacramento River, although a barge mounted system could overcome this concern.

The second group of choices included the vertical barrier extending part way across the river and located on the "right bank" of the river (V.D.R.), and a trapping and transportation system similar to that described above for the Sacramento River at "I" Street or at Freeport. The options for the latter include a trapping and barge (T.B.), a trapping and trucking (T.T.), and a trapping and bypass into an existing river channel (T.P.) system. The latter would use Sutter Slough and/or Steamboat Slough for the bypass channel.

The vertical barrier located on the "right bank" below the side channel would have the following consequences, as compared to the wing wall or groin alternative. First, it would guide impinged debris and fish to the side channel and could keep more of the flow in the Sacramento River, depending on the relative porosities of the two structures. The barrier should be relatively easy to remove, and would therefore avoid obstructing the flood channel in the Sacramento River. However, since less water would be diverted into the side channels, the carrying capacity issue would be of greater potential concern in this case.

The trapping and transportation alternatives would all have similar concerns and results at this site. The description of concerns for the Sacramento River at "I" Street and Freeport is adequate for these sites. Based on this, the most reasonable choice would appear to be that described in the previous section, using Sutter Slough as the bypass to avoid collecting, handling and transporting the fish.

Delta Cross-channel and Georgiana Slough Sites

These two sites were treated as a common problem, since they both lead to the central Delta, and closing off one of the paths simply leads to increased fish losses through the remaining path. Again, the ratings of the working group were the primary source of guidance in dealing with the issues at these sites.

The ratings fell into four general groups. The first was the radial gate (B.G.), followed by a group of four closely rated solutions. These included the three trapping and bypassing fish alternatives and the horizontal barrier extending all the way across the river (T.P., H.D.A., T.T. and T.B.). Since these four generally produce the same result, they will be treated that way. The third selection consisted of the perforated plate positive barrier fish screen (S.P.P.), and the last selection was the louver behavioral fish screen (S.B.L.).

The first selection, adding a radial gate structure to Georgiana Slough and closing both it and the existing gates at the Delta Cross-channel, presents the easiest and least complex solution to the problem. Such a solution benefits from the existence of the radial gates at the Delta Cross-channel, but would have to include boat and upstream migrant passage facilities. This solution could in increase reverse flows in the lower San Joaquin River (a problem particularly for striped bass), unless that was controlled by limiting exports or increasing releases from the San Joaquin River system. While such corrective measures are conceptually simple, the water supply costs would be large if they were implemented for a substantial portion of the salmon migration period. This alternative could significantly impact the yield of the water projects.

The second group of alternatives are similar to those already described, and present similar costs, and benefits. The major difference is the reduced distance for the transportation element of the program, and the greater tidal effect that would have to be dealt with lower in the river.

The third choice, screening the two locations with a perforated plate positive barrier presents some significant problems. This alternative was considered in evaluations of the "Governor's Water Plan," in 1983, and rejected in favor of a "New Hope Cross-channel." There is a good body of information on one iteration of this alternative in the documentation for that study. At that time, the goal was to maximize the efficiency of the structure, which in turn mandated a low approach velocity to the screen, and resulted in the need for a large surface area of screen material. In order to achieve sufficient surface area, the screen would be so large as to require major relocations of the towns of Locke and Walnut Grove. Because of that and difficulties associated with tidal action, the approach was judged infeasible. Since in this report we have a lesser goal of "improving survival," smaller screens with higher approach velocities could be considered, although our studies have shown that clogging and cleaning problems increase as the approach velocity to the screen increases.

The final choice, the installation of a louver fish screen at the two sites presents significant problems, but of a very different nature from those for the perforated plate screen. There is sufficient room to install a louver fish screen in both channels, but the net efficiency of such a screen is not known due to the changing approach velocity to the screen (flow reversals through the screen could occur unless the channels are fitted with gates).

The most practical alternative for this site appears to be the design and installation of a second set of radial gates on Georgiana Slough, with provisions in one or both channels for boat and adult upstream migrant fish passage facilities.

We arrived at this conclusion because of the available information on the effect of closing the Delta Cross-channel, and the lack of adequate information on which to base decisions about the other facilities.

Threemile Slough

The evaluations at this site resulted in three groups of alternatives. The first, radial gates (B.G.), was followed by a group of three closely ranked choices, the horizontal barrier from the "left bank," the vertical barrier from the "right bank," and the vertical barrier from the "left bank" (H.D.L., V.D.R., and V.D.L.). Finally, the three trapping alternatives (T.P., T.B., and T.T.) were listed. Studies have shown that chinook salmon released in this area have much better survival, making the benefits of any structure at this location less obvious.

SAN JOAQUIN RIVER SITES

Head of Old River Site

The ratings at this site resulted in three groups of selections. The first group included the radial gate and the trapping and transportation alternatives (B.G., T.T., T.P., and T.B.). The second was the horizontal barrier across the river (H.D.A.), while the third included the perforated plate positive barrier and the louver behavioral fish screens (S.P.P., and S.B.L.).

Of these alternatives, the radial gate is once again the most cost-effective, and practical solution. However, when one considers the diversions into the mouth of Middle and Old River, and the conclusion that little can be done at these sites, trapping and transportation schemes would have to be given equal weight. We can say with some confidence that it is likely to be easier to accomplish the task here than on the main Sacramento River, due to the smaller size of the project, particularly since there is no loss of yield to the Project's with this alternative.

Other Downstream Sites

These sites were grouped, since they appear to present the same general problems. Based on the evaluations none of the alternatives discussed are feasible at these sites, due to the need to screen all of them, and the sheer magnitude of the structural difficulties.

SWP and CVP Intake Sites

The evaluations of alternatives at these sites showed four general groupings. The first, radial gates (B.G.) assumes that diversions could be curtailed while the chinook salmon are passing the intake. This could require connecting the CVP intake to Clifton Court Forebay and enlarging the capacity of the forebay. The radial gate option was discarded due to the lack of flexibility within the SWP and CVP to provide for the extended curtailment, which would be required to significantly reduce chinook salmon losses. Alternately, storage south of the Delta could provide for a prolonged curtailment period.

The second group of choices include the trapping and transportation choices (T.T., T.B. and T.P.), and the louver behavioral fish screen (S.B.L.). These choices include the current fish protective facilities at the two sites (no improvement), or the louver fish screens could be moved to the head of an enlarged Clifton Court Forebay.

The third alternative is the perforated plate positive barrier fish screen (S.P.P.), and would have to be built at the head of an enlarged Clifton Court Forebay. This, coupled with the connection of the Contra Costa Canal and CVP intakes to the new forebay, and an effective transportation program for the salvaged chinook salmon would appear to maximize the protection of these fish. This would also be one of the most expensive solutions to the problem, short of the isolated conveyance facility.

SECTION G.

CONCLUSIONS

The following recommendations are listed by site, based on the information developed in Section F., above. The selections are presented to summarize what could be achieved in the system, based on the information developed in the process, and our collective experience here in California.

SACRAMENTO RIVER SITES

Sacramento River at "I" Street, Sutter and Steamboat Slough

Ideally, the trapping facility would intercept the entire river and would guide the outmigrants to either traps, or into Sutter or Steamboat sloughs to bypass the area of greatest concern. From traps, the chinook salmon outmigrants would have to be loaded and transported in order to avoid the areas of concern. Screening most or all of the river however was deemed infeasible, and such a structure would present a major problem to recreational and commercial traffic on the river, this alternative will not receive further consideration.

Since blocking the entire river width is not deemed feasible, partial barriers could be considered. The most likely design would be a floating (barge mounted) partial barrier which would extend down into the water at least 10 feet. The barrier would be situated to intercept the main body of water in the river (the "thalweg"), and guide the fish to a trapping facility. If such a facility is built, it might be reasonably expected to intercept one half of the chinook salmon outmigrants, and might attain an efficiency of about 50 percent. Consequently, we might expect that about one quarter of the chinook salmon outmigration could be successfully intercepted by a trapping facility. The survival of the chinook salmon after they were trapped would vary, depending on time of the year, water temperature and transportation method, but would be generally high. It is conceivable that 20 percent of the chinook salmon outmigrants could be saved with such a system.

Costs for such a facility would be quite high (Table 4), as would the operation and maintenance costs.

Delta Cross-channel and Georgiana Slough

The most practical solution to the problems associated with these two sites, and perhaps the most practical solution to the problem, involves closing the existing radial gates at the Delta Cross-channel and building similar gates at Georgiana Slough.

Closure of these two points of diversion from the Sacramento River would, of course, eliminate the losses of chinook salmon smolts to the central Delta. Such a plan of action would require "real time monitoring" to work effectively. Unfortunately, unless coupled with facilities which would allow the CVP and SWP to significantly reduce or cease export operations, this solution would adversely impact both San Joaquin river chinook salmon outmigrants and juvenile striped bass by increasing reverse flows in the lower San Joaquin River.

Planning for such a course of action is now in progress, and several projects, including the Delta Wetlands Project, the North and South Delta Water Management projects, the Los Banos Grandes and Los Vaqueros Reservoir projects, the Kern Groundwater Bank and the San Joaquin River water exchange program, would provide for some or all of the needed flexibility.

The construction of radial gates at Georgiana Slough would be relatively inexpensive (Table 4), but would not be much more difficult to operate and maintain than the existing radial gates at the Delta Cross-channel. Due to the nature of the boating traffic in Georgiana Slough, the new installation would have to include boat locks to accommodate fairly large recreational vessels, and it would be desirable to provide boat locks at the existing Delta Cross-channel.

SAN JOAQUIN RIVER SITES

Head of Old River

Two alternatives are available to solve the problems at this location. Both suffer from the problem that fish saved at this location will be exposed to the CVP and SWP export pumping operations in the south Delta at several other locations further downstream. These concerns could be moot if the barrier were coupled with the curtailment discussed for the Delta Cross-channel and Georgiana Slough alternatives, or if the chinook salmon outmigrants were collected, trapped and transported below the diversion points.

The first group of solutions include the radial gate and the trapping and transporting alternatives. Radial gates would keep both water and chinook salmon outmigrants in the San Joaquin River, away from the exports. Unfortunately this option would in all probability create water quality problems in the southeastern portion of the Delta. Construction costs for this facility would be higher than at Georgiana Slough (Table 4), and would probably have to include boat locks. The facility could be operated as a tidal pump, providing most if not all of the chinook salmon benefits, at an additional incremental cost. Such an alternative is under consideration in the South Delta Water Management planning, but the proposed locations, which are designed to improve south Delta water quality, are not intended to maximize the benefits to the fishery. Some combination of these plans may be the final result of this planning effort.

Trapping and transportation alternatives, described earlier, could be used at this location. The costs would be quite reasonable, and the size of the run being transported is small in comparison to the Sacramento River. Transporting these fish might, on the other hand, interfere with their ability to migrate back to the San Joaquin River, since they would be missing a major mixing area of the water from the two systems.

The second group of solutions include a horizontal barrier across the mouth of Old River, a "positive barrier" fish screen at the head of Old River which would allow the water to continue to move down Old River (avoiding the water quality issues) and keep the chinook salmon outmigrants in the main San Joaquin River, and a louver screen at this location. As discussed earlier in the Sutter and Steamboat Slough section, keeping the chinook salmon outmigrants in the river while the flow is diverted might present a carrying capacity problem, and the chinook salmon outmigrants would be subject to diversion further downstream. These alternatives would be significantly more expensive to build, operate and maintain than radial gates (Table 4).

CVP and SWP Intake

Two solutions are deemed to be feasible at these locations. To understand the nature of the problems, it may be useful to review the two installations. The CVP louver fish screens represented the state of the art at the time they were built (mid-1950's). Unfortunately, age, new biological design criteria for striped bass, the increased rates of export by the CVP, and the superimposition of the SWP exports on the south Delta have caused this facility to operate outside its original design specifications.

The SWP louver fish screens (built in the late 1960's) were improved by the operational experience gained with the CVP screens. With the construction of Clifton Court Forebay, which isolated the fish screens from tidal action, this facility has a better ability to maintain the desired operational conditions.

However, as we have learned recently, the forebay is a mixed blessing. Pre-screening losses in the forebay (attributable to predation by sub-legal striped bass) more than offset the gains in efficiency.

The first solution involves developing the capability to shut down the diversions from the south Delta to eliminate the fishery impacts. This had been discussed earlier, and would of course be the least cost alternative. Since this is not a very likely solution due to the impacts on project yield, the construction of a new "positive barrier" fish screen for the CVP and SWP (and the Contra Costa Canal) intakes is considered as the only viable solution.

New fish screens in the south Delta would be expensive (Table 4), and would require that a collection, trapping and transportation system be included in the system. In addition to the benefits to chinook salmon, other species would also benefit from the new, properly designed and operated fish screen.

SECTION H.

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Appendix A - Site Descriptions

APPENDIX A

SITE DESCRIPTIONS

The general locations for our site morphology sites are shown in Figure 1.

DEFINITIONS

C.L. Levee - Center line at top of levee.

Left, Right - Refers to sides of channel when facing downstream.

Max. Depth - Maximum depth of channel measured from the 0 ft. elevation.

W.E.L.B. - Water's edge, left bank.

W.E.R.B. - Water's edge, right bank.

Width - Width of channel measured at the 0 ft. elevation. (Need width at top of structure.)

SACRAMENTO RIVER SITE DESCRIPTIONS:

1) Sacramento Sites

a) Sacramento River at "I" Street (Figure 3)

Channel Cross-section No. SA00 (05-13-75)

Width = 685 ft.

Max. Depth = 14 ft.

b) Sacramento River at Freeport (Figures 2 and 3)

Channel Cross-section No. SA08 (05-13-75)

Width = 547 ft.

Max. Depth = 21 ft.

INSERT FIGURE 1 HERE

INSERT FIGURE 2 HERE

INSERT FIGURE 3 HERE

2) Sutter-Steamboat Slough Sites

a) Sacramento River above Sutter Slough (Figures 4 and 5)

Channel Cross-section No. SAC13 (03-27-73)

Width = 555 ft.

Max. Depth = 28 ft.

b) Sacramento River below Sutter Slough (Figures 4 and 5)

Channel Cross-section No. SA11 (05-13-75)

Width = 421 ft.

Max. Depth = 25 ft.

c) Sutter Slough at Head (Powerline Crossing - Figures 4 and 6).

Channel Cross-section No. SAC12 (03-27-73)

Width = 280 ft.

Max. Depth = 18 ft.

d) Sacramento River above Steamboat Slough (Figures 4 and 6)

Channel Cross-section No. SAC 11 (03-27-73)

Width = 415 ft.

Max. Depth = 29 ft.

e) Sacramento River below Steamboat Slough (Figures 4 and 7)

Channel Cross-section No. SA12 (05-13-75)

Width = 338 ft.

Max. Depth = 25 ft.

f) Steamboat Slough at Head (Figures 4 and 7)

Channel Cross-section No. SAC10 (03-28-73)
Width = 228 ft.

Max. Depth = 14 ft.

INSERT FIGURE 4 HERE

INSERT FIGURE 5 HERE

INSERT FIGURE 6 HERE

INSERT FIGURE 7 HERE

3) Delta Cross-channel - Georgiana Slough Sites

a) Sacramento River above Delta Cross-channel (Figures 8 and 9)

Channel Cross-section No. SAC18 (04-10-73)

Width = 400 ft. (Left boundary = west edge of River Road Bridge)

Max. Depth = 29 ft.

b) Sacramento River below Delta Cross-channel (Figures 8 and 10)

Channel Cross-section No. SAC16 (04-10-73)

Width = 339 ft.

Max. Depth = 38 ft.

c) Delta Cross-channel at Head (15 ft. west of River Road Bridge - Figures 8 and 10)

Channel Cross-section No. SAC21 (04-10-73)

Width = 215 ft. (approx.) (Right boundary = stopped cross-section at approximately 3 ft. in depth from right bank)

Max. Depth = 19 ft.

d) Delta Cross-channel below gates (Figures 8 and 11)

Channel Cross-section No. DCC1 (06-84)

Width = 333 ft.

Max. Depth = 19 ft.

e) Sacramento River above Georgiana Slough (at Walnut Grove tide gauge - Figures 8 and 11)

Channel Cross-section No. SAC3 (02-19-74)

Width = 490 ft.

Max. Depth = 19 ft.

INSERT FIGURE 8 HERE

INSERT FIGURE 9 HERE

INSERT FIGURE 10 HERE

INSERT FIGURE 11 HERE

f) Sacramento River below Georgiana Slough (Figures 8 and 12)

Channel Cross-section No. SAC1 (02-19-74)

Width = 368 ft.

Max. Depth = 27 ft.

g) Georgiana Slough at Head (Figures 8 and 12)

Channel Cross-section No. GS6 (02-15-74)

Width = 190 ft.

Max. Depth = 17 ft.

h) Georgiana Slough above Highway Bridge (Figures 8 and 13)

Channel Cross-section No. GS"A" (06-29-67)

Width = 165 ft.

Max. Depth = 23 ft.

4) Three Mile Slough Site

No channel cross-sections could be found for this area (Figure 14).

SAN JOAQUIN RIVER SITE DESCRIPTIONS:

1) Old River at Mossdale Sites

a) San Joaquin River above Old River (Figures 15 and 16)

Channel Cross-section No. SA"A" (10-11-78)

Width = 303 ft.

Max. Depth = 17 ft.

Gauge Height = 9.4 ft.

INSERT FIGURE 12 HERE

INSERT FIGURE 13 HERE

INSERT FIGURE 14 HERE

INSERT FIGURE 15 HERE

INSERT FIGURE 16 HERE

b) San Joaquin River below Old River (Figures 15 and 16)

Channel Cross-section No. SJ147 (08-27-74)

Width = 167 ft.

Max. Depth = 9 ft.

c) Old River at Head (Figures 15 and 17)

Channel Cross-section No. OR"A" (10-11-78)

Width = 190 ft.

Max. Depth = 10 ft.

Gauge Height = 5.0 ft.

d) Old River below Head (Figures 15 and 17)

Channel Cross-section No. O-1 (06-19-73)

Width = 205 ft.

Max. Depth = 8 ft.

2) Mouth of Middle and Old River Sites located at the junction with the San Joaquin River in the Central Delta.

No channel cross-sections could be found for this area (Figure 18).

3) CVP and SWP Intake Sites

No channel cross-sections could be found for this area (Figure 19).

INSERT FIGURE 17 HERE

INSERT FIGURE 18 HERE

INSERT FIGURE 19 HERE

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Appendix B - Site Specific Evaluations

INTRODUCTION

The Fish Facility Working Group's task was to consider structural means to improve salmon smolt survival in the Sacramento-San Joaquin Estuary and prepare a report of available alternatives.

The working group established the following basic premises under which this assessment was conducted:

1) In the Sacramento River the group was not concerned with trying to improve salmon survival when outflows at "I" Street were greater than 25,000 cfs. In the San Joaquin River the group was not concerned with trying to improve salmon survival when outflows at Vernalis were greater than 12,000 cfs.

2) The Delta Cross-channel and the head of Georgiana Slough were to be treated as a common problem.

3) The options considered were not to be bounded by DWR's Delta Alternatives, but were to consider the needs of those efforts, which include:

SOUTH DELTA

1. Barrier of tidal gate at head of Old River.
2. Sills in Old River and Middle River.
3. Screens at head of Old River.
4. Improve efficiency of CVP screens at Tracy.
5. New screened intake for CCF with CVP intake in CCF.

NORTH DELTA

1. Screen Delta Cross-channel.
2. Screen Georgiana Slough.
3. Tidal gates in Georgiana Slough.
4. Guidance screens in Sacramento River above Steamboat Slough.

4) A trapping and transport program above the Delta was also to be considered.

5) The group was concerned with means to improve smolt survival and not fry survival.

INITIAL EVALUATION PROCESS

Rating evaluation forms were given to each member of the Delta Salmon Fish Facility working group, as well as to Marty Kjelson (head of the Delta Salmon Team), to try and develop a consensus of opinion as to which types of structures would be most suitable to enhance the survival of juvenile salmon smolts migrating past selected sites in the Sacramento-San Joaquin Estuary. A matrix of the 13 types of structures, by the 10 criteria they were to be rated on, were provided for each of the 10 sites considered. Two additional sites, SACUP and CCFIN, were added by some of the judges.

METHODS

RATING JUDGES

The eleven members of the working group who were asked to evaluate the site specific structural options were:

WHO	IDENTIFICATION
AP	Alan Pickard, DFG - Biologist
BC	Barry Collins, DFG - Biologist
CH	Chuck Hanson, TENERA Corp. - Biologist
DO	Dan Odenweller, DFG - Biologist
GE	George Eicher, Eicher Assoc. - Biologist/Engineer
JG	Jim Goodwin, USBR - Engineer
JS	Jim Snow, DWR - Engineer
LS	Larry Smith, DWR - Engineer
MK	Marty Kjelson, USFWS - Biologist
SR	Steve Rainey, NMFS - Engineer
SS	Stephani Spaar, DWR - Biologist

Alan Pickard's evaluation was lost in the mail and has not been replaced, although he along with the rest of the working group reviewed Barry Collins' analysis of the evaluation (Collins 1989), and provided comments and discussion.

SITES OF CONCERN

SITE	DESCRIPTION
Sacramento River	
CROSS	Delta Cross-channel

SITE	DESCRIPTION
GEORG	Georgiana Slough
STEAM	Steamboat Slough
SUTT	Sutter Slough
THREE	Three Mile Slough
SACUP	Sacramento River upstream of Sutter Slough
San Joaquin River	
OLD	Old River Head
MIDD	Middle River Mouth
MOKEL	Mokelumne River - Old River Mouth
CVP	Central Valley Project Intake
SWP	State Water Project Intake
CCFIN	Clifton Court Forebay new joint SWP/CVP Intake

TYPES OF STRUCTURES EVALUATED

1) Fish Screening Structure Intercepting All of the Flow

Traditional types of fish screens would span the entire river channel. These would create a hindrance to navigation, requiring boat passage facilities at most locations. Screens might also pose flood control problems if associated structures, such as foundations, served as a restriction to flow. Negative impacts can also be expected on upstream migrating adult anadromous fish; therefore, provisions to allow passage would have to be provided.

TYPE	DESCRIPTION
SBL	Louver behavioral screen.
SPP	Perforated plate positive barrier fish screen.
SPD	Rotary drum positive barrier fish screen.

2) Fish Diverting Structures Intercepting Only Part of the Flow.

Horizontal partial barriers extending all the way, or part of the way, across the river and hanging down from a surface structure would allow water to pass through, but discourage juvenile fish passage. This would probably be a behavioral device such as a louver or trashrack, in order to restrict the size of the structure required and minimize flow disruption. The "TYPE" names listed below are a revision of those used in Collins' earlier report (Collins 1989), and were made to be consistent with conventional usage.

TYPE	DESCRIPTION
HDA	Horizontal barrier extending all the way across the river channel.
HDL	Horizontal barrier extending part way across the river channel from the left bank.
HDR	Horizontal barrier extending part way across the river channel from the right bank.

3) Vertical partial barriers rising vertically from bottom to surface and extending part way across the river would allow water to pass through, but discourage juvenile fish passage.

TYPE	DESCRIPTION
VDL	Vertical barrier extending part way across the river channel from the left bank.
VDR	Vertical barrier extending part way across the river channel from the right bank.
BW	Wing wall and groin.

4) Flow barriers.

TYPE	DESCRIPTION
BG	Radial gate.

5) Trapping devices.

TYPE	DESCRIPTION
TP	Bypassing trapped fish back to the river.
TT	Trucking trapped fish to below the impact area.
TB	Barging trapped fish to below the impact area.

EVALUATION CRITERIA

The working group agreed to rate each type of structure against 10 criteria on a scale of 0 to 10. A rating of 0 would represent the most undesirable condition, and a rating of 10 would represent the most desirable condition. This is a revision of the original basis used to rate these criteria in Collins earlier report (Collins 1989), and was made to minimize confusion, and facilitate comparisons between alternatives.

CRIT	DESCRIPTION
FEAS	Feasibility of obtaining permits to build the structure. Ratings: 0 = Infeasible, 10 = No permit needed, or structure already exists.
BUILD	Likelihood that the structure can actually be built. Ratings: 0 = Impossible, 10 = Very easy to build, or already exists and will need only slight modification.
FLOW	Percentage of the flow in the river that the structure will intercept. Ratings: 0 = 0%, 10 = 100%.
NAV	Impacts on navigation. Ratings: 0 = Blocks navigation, 10 = No effect.
EFF	Screening or diverting efficiency of the structure on salmon smolts. Ratings: 0 = 0%, 10 = 100%.
DNMIG	Screening or diverting efficiency on other downstream migrants. Ratings: 0 = 0%, 10 = 100%.
UPMIG	Impacts on upstream adult migrants. Ratings: 0 = 0%, 10 - 100%.
PRED	Predation loss of smolts and other juvenile fish. Ratings: 0 = 100% loss, 10 = 0% loss.
CCOST	Construction cost index. Ratings: 0 = Most inexpensive, 10 = No cost.
OCOST	Operation and maintenance cost Ratings: 0 = Most expensive, 10 = No cost.

RESULTS

An analysis was conducted of the initial site specific evaluations made by the working group (Collins 1989). The average criteria ratings from the evaluation process are provided in Table 1 of this Appendix. The individual evaluations are provided in Table 2 of this Appendix.

Although the initial evaluation was deemed not to be completely satisfactory because of incomplete responses by the judges, two general conclusions were made suggesting that a simplified approach could be taken. These were:

1) For a particular structure, most of the criteria ratings were not significantly different among the sites considered. Therefore, with a few exceptions, only general criteria ratings are needed for each structure, not site specific ratings.

For the exceptions mentions above (i.e. criteria ratings for a structure appeared to be site dependent) examination of data suggested that the sites could be combined as follows:

MIDD + MOKEL
STEAM + SUTT + THREE
CROSS + GEORG + OLD
CVP + SWP + CCFIN
SACUP

2) The ratings given to similar types of structures are basically the same. Five general types of structures were identified:

SCREENS	= SBL + SPP + SPD
HDA	= HDA
DIVERTERS	= HDR + HDL + VDR + VDL + BW
GATES	= BG
TRAPS	= TP + TT + TB

Staged Construction

The effectiveness of some options evaluated could only be roughly estimated. Selection of such options should incorporate a staged construction approach; building and operating only a portion of the device with making an irretrievable commitment to the design of the remainder of the project. However, the device must allow for meaningful testing to provide a realistic basis for applying the results to the decision on the remainder of the project.

TABLE 1. AVERAGE CRITERIA RATINGS FROM THE SITE-SPECIFIC STRUCTURAL EVALUATION. GROUPED BY SITE.

SITE: CCFIN

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDL	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	4.7	1.0
HDR	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	4.7	1.0
SBL	9.3	9.7	10.0	10.0	6.3	5.7	9.3	8.3	4.7	1.7
SPD	9.0	9.0	10.0	10.0	8.3	7.5	9.0	8.0	3.7	0.5
SPP	9.0	9.0	10.0	10.0	9.3	7.5	9.0	7.5	3.3	0.0
TB	8.0	8.0	10.0	10.0	8.0	8.0	8.0	6.0	8.7	7.0
TT	9.0	9.0	10.0	10.0	6.5	6.5	9.0	7.5	6.7	4.5

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	9.5	10.0	8.8	2.3	8.8	8.0	5.3	7.3	9.5	5.5
BW	5.4	7.4	2.7	6.2	1.6	1.6	5.4	5.9	8.8	7.9
HDA	4.6	7.6	4.9	3.2	3.3	2.8	5.7	5.3	8.4	5.4
HDL	5.1	6.5	2.8	6.9	2.2	1.7	6.0	6.0	8.3	5.4
HDR	6.6	6.4	4.0	6.4	2.4	1.8	7.0	7.0	8.4	5.4
SBL	5.0	7.1	10.0	3.2	4.0	2.7	3.0	4.8	7.9	4.6
SPD	4.7	6.7	10.0	2.8	6.3	5.2	3.0	4.8	7.0	4.0
SPP	4.8	6.5	10.0	3.2	6.8	4.9	2.5	4.8	7.1	4.8
TB	6.2	8.1	7.9	5.9	4.7	4.3	3.7	5.2	7.9	4.0
TP	5.8	8.2	7.7	5.8	4.0	4.2	3.8	4.6	8.1	5.7
TT	6.2	8.1	7.9	5.9	4.6	4.2	3.7	4.9	8.0	4.3
VDL	5.0	6.7	3.4	7.1	2.3	1.8	5.9	5.4	8.4	6.0
VDR	6.8	6.8	4.4	5.5	2.3	1.5	8.0	6.8	9.2	6.8

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	8.0	6.3	10.0	8.3	7.3	6.7	9.0	7.0	7.6	4.7
BW	8.0	6.3	3.8	6.7	1.3	1.3	7.0	8.3	8.6	8.7
HDA	9.0	5.0	6.7	6.7	2.3	1.7	6.7	8.0	8.4	7.0
HDL	9.0	5.3	3.0	8.0	1.3	1.0	9.0	8.3	8.9	7.3
HDR	9.0	5.3	3.0	8.0	1.3	1.0	9.0	8.7	9.1	7.3
SBL	9.0	8.8	10.0	8.2	6.2	4.0	7.8	7.3	7.9	4.2
SPD	8.7	8.5	10.0	8.2	8.1	6.5	7.8	7.2	6.1	3.0
SPP	8.7	8.5	10.0	8.2	8.6	6.7	7.8	7.2	6.3	3.2
TB	8.3	9.0	6.3	6.9	5.5	5.8	9.0	4.5	8.5	4.8
TP	7.7	7.7	8.3	5.7	6.7	5.7	8.7	5.3	8.7	7.3
TT	8.3	9.8	6.3	7.0	5.5	5.8	9.0	3.8	8.3	5.5
VDL	9.0	5.3	4.2	8.0	1.3	1.0	9.0	8.3	8.9	7.3
VDR	9.0	5.3	4.2	8.0	1.3	1.0	9.0	8.3	8.9	7.3

TABLE 1. CONTINUED

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	4.4	7.6	9.0	3.8	9.0	7.8	5.2	6.2	6.8	5.8
BW	5.0	8.2	2.7	5.8	2.0	2.1	5.4	6.0	9.0	8.0
HDA	4.1	7.2	5.0	2.7	3.1	3.0	5.7	5.3	8.4	5.7
HDL	4.6	7.2	2.6	6.5	2.5	2.1	6.0	6.0	8.4	5.7
HDR	5.8	6.4	3.6	6.2	2.2	1.8	7.0	7.0	8.3	5.4
SBL	4.2	6.4	10.0	1.9	3.9	3.2	3.0	4.8	7.7	4.5
SPD	3.8	6.0	10.0	1.8	6.3	5.3	3.0	4.8	6.8	4.1
SPP	4.0	5.9	10.0	1.9	6.8	5.0	2.5	4.8	6.9	3.7
TB	5.9	7.9	7.7	4.9	4.7	4.3	3.7	5.2	8.1	4.4
TP	5.2	8.0	7.4	4.7	4.0	4.2	3.7	4.7	8.6	6.2
TT	5.8	7.9	7.7	4.9	4.6	4.2	3.7	4.9	8.1	4.9
VDL	4.4	7.2	3.2	6.7	2.9	2.4	5.9	5.4	8.7	6.4
VDR	5.8	6.3	3.9	5.3	2.0	1.5	8.0	6.8	9.2	6.8

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	3.7	4.0	10.0	2.0	10.0	9.3	4.0	4.7	6.0	3.3
BW	5.7	4.0	3.2	5.3	2.7	2.3	7.3	7.7	7.8	8.3
HDA	3.3	3.3	6.7	1.3	3.0	2.0	5.3	6.3	7.1	5.7
HDL	6.0	4.0	3.5	4.7	1.3	1.3	7.3	7.7	8.2	6.7
HDR	6.0	4.0	3.5	4.7	1.7	1.3	7.3	7.7	8.2	6.7
SBL	2.7	2.0	10.0	0.7	2.7	2.0	2.0	5.7	6.0	2.7
SPD	2.7	2.0	10.0	0.7	5.7	4.3	2.0	5.7	4.7	2.0
SPP	2.7	2.0	10.0	0.7	6.3	5.0	2.0	5.7	5.3	2.3
TB	6.2	6.5	4.8	6.3	2.8	2.3	5.0	4.3	8.1	6.3
TP	5.7	6.2	4.8	6.0	2.3	2.0	4.8	4.2	8.1	6.7
TT	6.2	6.5	4.8	6.3	2.8	2.2	5.0	3.8	8.2	6.3
VDL	6.0	4.0	3.8	4.7	2.0	2.0	7.3	7.3	8.0	6.7
VDR	6.0	4.0	3.8	4.7	2.3	2.0	7.3	7.3	8.0	6.7

TABLE 1. CONTINUED

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	3.7	4.0	10.0	2.0	10.0	9.3	3.7	4.7	6.2	3.7
BW	5.7	4.0	3.2	5.3	2.7	2.3	7.3	7.7	8.0	8.7
HDA	3.3	3.7	6.7	1.3	3.0	2.0	5.0	6.3	7.3	6.0
HDL	6.0	4.0	3.5	4.7	1.7	1.7	7.3	7.7	8.4	7.0
HDR	6.0	4.0	3.5	4.7	1.7	1.3	7.3	7.7	8.4	7.0
SBL	2.7	2.0	10.0	0.7	2.7	2.0	1.7	5.7	6.2	3.0
SPD	2.7	2.0	10.0	0.7	5.7	4.3	1.7	5.7	4.9	2.3
SPP	2.7	2.0	10.0	0.7	6.3	5.0	1.7	5.7	5.6	2.7
TB	6.2	6.5	4.8	6.3	2.6	2.2	5.0	4.3	8.2	6.3
TP	5.7	6.2	4.8	6.0	2.3	1.8	4.8	4.2	8.2	6.8
TT	6.2	6.5	4.8	6.3	2.7	2.0	5.0	3.8	8.4	6.5
VDL	6.0	4.0	3.8	4.7	2.0	2.0	7.3	7.3	8.2	7.0
VDR	6.0	4.0	3.8	4.7	2.3	2.0	7.3	7.3	8.2	7.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	4.5	7.5	8.8	2.3	7.3	6.9	3.0	4.8	8.0	7.1
BW	6.0	6.1	4.1	5.3	1.7	1.6	5.3	5.3	8.9	7.6
HDA	3.5	6.9	5.5	1.1	2.4	2.1	4.9	5.5	8.2	6.0
HDL	5.0	6.6	3.1	6.0	1.8	1.5	5.9	6.0	8.7	6.6
HDR	5.8	6.5	3.6	6.3	1.5	1.0	5.2	5.2	8.9	6.7
SBL	4.9	6.7	10.0	0.9	4.2	3.3	2.0	5.2	8.3	5.0
SPD	4.3	6.3	10.0	0.8	6.3	5.3	1.7	4.8	7.8	4.3
SPP	4.9	5.9	10.0	0.9	6.8	5.0	1.7	5.2	7.8	4.2
TB	6.0	7.6	6.6	4.5	3.9	3.7	4.0	5.4	8.2	5.0
TP	5.1	8.0	6.7	5.0	3.1	3.6	3.4	4.6	8.4	7.1
TT	5.9	8.4	6.6	4.6	3.7	3.6	4.3	5.1	8.4	6.2
VDL	5.0	6.6	3.7	6.0	2.0	1.6	5.4	5.5	8.8	6.9
VDR	5.8	6.5	4.1	6.3	1.5	1.0	5.2	5.0	8.9	6.7

SITE: SACUP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TT	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0

TABLE 1. CONTINUED.

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.2	3.6	8.0	0.8	4.2	4.2	1.8	2.8	3.9	3.4
BW	3.9	7.2	2.5	7.0	2.0	2.2	6.6	5.4	8.6	7.4
HDA	1.5	5.1	4.4	1.7	2.7	1.9	4.7	4.6	7.3	5.6
HDL	4.4	5.9	2.9	6.6	2.0	1.3	6.5	5.2	8.2	5.3
HDR	4.6	5.3	2.6	7.1	2.2	1.6	6.4	5.1	8.4	5.3
SBL	1.0	3.6	10.0	0.4	2.6	1.8	0.8	3.4	4.1	3.2
SPD	1.0	3.4	10.0	0.4	4.4	3.4	0.8	3.4	2.7	2.0
SPP	1.0	3.5	10.0	0.4	5.0	3.8	0.8	3.4	3.6	3.0
TB	5.4	6.9	4.4	5.6	3.4	2.7	5.6	4.9	8.3	5.4
TP	4.9	6.6	4.4	5.4	3.1	2.4	5.4	4.7	8.3	5.7
TT	5.4	6.9	4.4	5.7	3.3	2.6	5.6	4.4	8.4	5.6
VDL	4.4	5.9	3.5	6.6	2.3	1.7	6.1	4.6	7.9	5.3
VDR	4.6	5.3	3.3	7.1	2.6	2.0	6.4	4.8	8.1	5.1

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.2	3.6	8.0	0.8	4.2	4.2	1.8	2.8	3.9	3.4
BW	3.9	7.2	2.5	7.0	2.0	2.2	6.6	5.4	8.6	7.4
HDA	1.5	5.1	4.4	1.3	2.7	1.9	4.7	4.6	7.3	5.6
HDL	4.1	5.8	2.9	6.6	2.0	1.3	6.5	5.2	8.2	5.3
HDR	4.6	5.3	2.6	7.1	2.2	1.6	6.4	5.1	8.4	5.3
SBL	1.0	3.6	10.0	0.4	2.6	1.8	0.8	3.4	4.1	3.2
SPD	1.0	3.4	10.0	0.4	4.4	3.4	0.8	3.4	2.7	2.0
SPP	1.0	3.5	10.0	0.4	5.0	3.8	0.8	3.4	3.6	3.0
TB	5.4	6.9	4.4	5.6	3.5	2.7	5.6	4.9	8.3	5.4
TP	4.9	6.6	4.4	5.4	3.1	2.4	5.4	4.7	8.3	5.7
TT	5.4	6.9	4.4	5.7	3.4	2.6	5.6	4.4	8.4	5.6
VDL	4.1	5.8	3.5	6.6	2.3	1.7	6.1	4.6	7.9	5.3
VDR	4.6	5.3	3.3	7.1	2.6	2.0	6.4	4.8	8.1	5.1

TABLE 1. CONTINUED.

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	9.7	6.7	10.0	8.3	7.3	6.7	9.0	7.0	9.1	4.7
BW	8.0	6.3	3.8	8.7	1.3	3.7	9.0	8.3	8.6	8.7
HDA	9.0	5.0	6.7	6.7	2.3	1.7	6.7	8.0	8.4	7.0
HDL	6.8	4.0	3.5	6.0	1.4	0.8	6.8	6.5	8.3	6.3
HDR	6.8	4.0	3.5	6.0	1.4	0.8	6.8	6.5	8.3	6.3
SBL	8.8	8.7	10.0	8.8	4.8	3.3	6.3	6.0	7.3	4.6
SPD	8.4	6.3	10.0	8.6	6.2	5.0	5.9	5.5	5.4	2.8
SPP	8.4	8.3	10.0	8.6	6.7	5.1	5.9	5.5	6.1	3.6
TB	7.9	8.9	6.6	7.9	3.7	4.1	6.3	4.3	8.2	6.0
TP	8.2	8.6	7.8	7.0	3.6	3.4	5.2	3.2	8.8	7.6
TT	8.8	9.4	7.0	8.3	4.1	4.3	6.8	4.3	8.3	6.1
VDL	9.0	5.3	4.2	8.0	1.0	1.0	9.0	8.3	8.9	7.3
VDR	9.0	5.3	4.2	8.0	1.0	1.0	9.0	8.3	8.9	7.3

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.5	4.2	9.2	1.0	5.8	5.0	4.0	3.5	4.0	3.2
BW	4.0	6.5	2.9	4.3	2.8	2.7	8.5	7.7	8.8	7.3
HDA	3.8	5.5	5.7	1.8	3.7	3.0	7.8	6.3	8.1	4.8
HDL	4.5	6.0	2.7	4.2	2.7	2.8	8.3	7.0	8.9	5.7
HDR	5.5	5.3	3.3	3.5	1.8	1.5	8.3	6.5	8.8	6.5
SBL	3.2	4.3	10.0	1.0	4.2	3.3	3.3	5.8	6.5	2.3
SPD	3.2	3.8	10.0	1.0	7.3	6.3	4.2	6.3	5.6	2.5
SPP	2.6	3.7	10.0	1.0	5.8	4.8	2.5	4.4	4.4	1.6
TB	5.6	7.3	6.5	4.6	4.3	3.8	4.3	4.8	8.6	5.0
TP	5.1	7.0	6.5	4.5	4.0	3.5	4.1	4.5	8.6	6.3
TT	5.6	7.3	6.5	4.6	4.3	3.6	4.3	4.4	8.7	5.1
VDL	4.5	6.0	3.4	4.2	3.3	2.8	7.5	7.0	8.8	5.7
VDR	5.5	5.3	4.1	3.5	3.0	2.3	8.3	6.5	8.7	6.5

TABLE 2. INDIVIDUAL CRITERIA RATINGS FROM THE SITE-SPECIFIC STRUCTURAL EVALUATION. GROUPED BY RATER.

WHO: BC

SITE: CCFIN

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	10.0	10.0	10.0	7.0	7.0	8.0	8.0	5.3	3.0
SPD	9.0	9.0	10.0	10.0	7.0	7.0	8.0	8.0	4.0	1.0
SPP	9.0	9.0	10.0	10.0	9.0	7.0	8.0	7.0	3.3	0.0
TB	8.0	8.0	10.0	10.0	8.0	8.0	8.0	6.0	8.7	7.0
TT	8.0	8.0	10.0	10.0	8.0	8.0	8.0	6.0	8.7	7.0

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	9.0	3.0	3.0	9.0	8.0	9.3	9.0
HDA	5.0	7.0	5.0	8.0	3.0	3.0	7.0	8.0	8.0	7.0
HDL	3.0	4.0	2.0	9.0	3.0	4.0	7.0	8.0	8.7	8.0
SBL	5.0	7.0	10.0	8.0	6.0	6.0	3.0	6.0	6.7	5.0
SPD	5.0	7.0	10.0	8.0	7.0	6.0	3.0	6.0	6.7	5.0
SPP	5.0	7.0	10.0	8.0	7.0	6.0	3.0	6.0	6.7	5.0
TB	4.0	6.0	10.0	8.0	6.0	6.0	3.0	6.0	8.7	7.0
TP	4.0	6.0	10.0	8.0	6.0	6.0	3.0	6.0	8.7	7.0
TT	4.0	6.0	10.0	8.0	6.0	6.0	3.0	6.0	8.7	7.0
VDL	3.0	4.0	2.0	9.0	3.0	4.0	7.0	8.0	8.7	8.0

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	6.0	9.0	10.0	10.0	6.0	6.0	8.0	7.0	5.3	3.0
SPD	6.0	9.0	10.0	10.0	6.0	6.0	8.0	7.0	4.0	1.0
SPP	6.0	9.0	10.0	10.0	6.0	6.0	8.0	7.0	3.3	0.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	9.0
HDA	4.0	7.0	5.0	3.0	3.0	4.0	7.0	8.0	8.0	7.0
HDL	3.0	4.0	2.0	6.0	3.0	4.0	7.0	8.0	8.7	8.0
SBL	4.0	3.0	10.0	3.0	6.0	7.0	3.0	6.0	6.7	5.0
SPD	4.0	3.0	10.0	3.0	7.0	7.0	3.0	6.0	6.7	5.0
SPP	4.0	3.0	10.0	3.0	7.0	7.0	3.0	6.0	6.7	5.0
TB	2.0	6.0	8.0	4.0	6.0	6.0	3.0	6.0	8.7	7.0
TP	2.0	6.0	8.0	4.0	6.0	6.0	3.0	6.0	8.7	7.0
TT	2.0	6.0	8.0	4.0	6.0	6.0	3.0	6.0	8.7	7.0

VDL	3.0	4.0	2.0	6.0	3.0	4.0	7.0	8.0	8.7	8.0

TABLE 2. CONTINUED

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0
TP	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0
TT	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	2.0	3.0	5.0	7.0	2.0	2.0	8.0	8.0	8.7	7.0
TP	2.0	3.0	5.0	7.0	2.0	2.0	8.0	8.0	8.7	7.0
TT	2.0	3.0	5.0	7.0	2.0	2.0	8.0	8.0	8.7	7.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	3.0	2.0	10.0	2.0	10.0	10.0	3.0	6.0	7.3	8.0
BW	5.0	2.0	7.0	6.0	3.0	3.0	7.0	7.0	7.3	8.0
HDA	2.0	3.0	5.0	3.0	3.0	3.0	7.0	8.0	8.0	7.0
HDL	3.0	4.0	2.0	6.0	3.0	3.0	7.0	8.0	8.7	8.0
SBL	2.0	3.0	10.0	3.0	6.0	6.0	1.0	6.0	6.7	5.0
SPD	2.0	3.0	10.0	3.0	7.0	7.0	1.0	6.0	6.7	5.0
SPP	2.0	3.0	10.0	3.0	7.0	7.0	1.0	6.0	6.7	5.0
TB	2.0	6.0	8.0	4.0	6.0	6.0	3.0	8.0	8.7	7.0
TP	2.0	6.0	8.0	4.0	6.0	6.0	3.0	8.0	8.7	7.0
TT	2.0	6.0	8.0	4.0	6.0	6.0	3.0	8.0	8.7	7.0
VDL	3.0	4.0	2.0	6.0	3.0	3.0	7.0	8.0	8.7	8.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	9.0
HDL	3.0	4.0	2.0	6.0	1.0	1.0	7.0	8.0	8.7	8.0
HDR	3.0	4.0	2.0	6.0	2.0	2.0	7.0	8.0	8.7	8.0
TB	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0
TP	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0
TT	2.0	3.0	5.0	7.0	3.0	3.0	8.0	8.0	8.7	7.0
VDL	3.0	4.0	3.0	6.0	1.0	1.0	7.0	6.0	8.7	8.0
VDR	3.0	4.0	3.0	6.0	3.0	3.0	7.0	6.0	8.7	8.0

TABLE 2. CONTINUED.

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	9.0
HDL	3.0	4.0	2.0	6.0	1.0	1.0	7.0	8.0	8.7	8.0
HDR	3.0	4.0	2.0	6.0	2.0	2.0	7.0	8.0	8.7	8.0
TB	2.0	3.0	5.0	7.0	4.0	3.0	8.0	8.0	8.7	7.0
TP	2.0	3.0	5.0	7.0	4.0	3.0	8.0	8.0	8.7	7.0
TT	2.0	3.0	5.0	7.0	4.0	3.0	8.0	8.0	8.7	7.0
VDL	3.0	4.0	3.0	6.0	1.0	1.0	7.0	6.0	8.7	8.0
VDR	3.0	4.0	3.0	6.0	3.0	3.0	7.0	6.0	8.7	8.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	3.0	9.0	10.0	10.0	7.0	7.0	8.0	8.0	5.3	3.0
SPD	3.0	9.0	10.0	10.0	7.0	7.0	8.0	8.0	4.0	1.0
SPP	3.0	9.0	10.0	10.0	8.0	7.0	8.0	8.0	3.3	0.0
TB	1.0	6.0	7.0	10.0	6.0	6.0	8.0	6.0	8.7	7.0
TT	1.0	6.0	7.0	10.0	6.0	6.0	8.0	6.0	8.7	7.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	9.0
HDA	4.0	7.0	5.0	3.0	3.0	2.0	8.0	8.0	8.0	7.0
HDL	3.0	4.0	2.0	6.0	3.0	4.0	7.0	8.0	8.7	8.0
SBL	4.0	3.0	10.0	3.0	6.0	6.0	3.0	6.0	6.7	5.0
SPD	4.0	3.0	10.0	3.0	7.0	7.0	3.0	6.0	6.7	5.0
SPP	4.0	3.0	10.0	3.0	7.0	7.0	3.0	6.0	6.7	5.0
TB	2.0	6.0	8.0	4.0	6.0	6.0	3.0	7.0	8.7	7.0
TP	2.0	6.0	8.0	4.0	6.0	6.0	3.0	7.0	8.7	7.0
TT	2.0	6.0	8.0	4.0	6.0	6.0	3.0	7.0	8.7	7.0
VDL	3.0	4.0	2.0	6.0	3.0	4.0	7.0	8.0	8.7	8.0

TABLE 2. CONTINUED.

WHO: CH

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	2.0	10.0	10.0	8.0	6.0	8.0	8.0
BW	5.0	10.0	3.0	7.0	3.0	1.0	9.0	8.0	9.3	9.0
HDA	2.0	5.0	10.0	2.0	4.0	1.0	9.0	9.0	8.7	9.0
HDL	5.0	8.0	5.0	7.0	3.0	1.0	9.0	9.0	9.3	9.0
HDR	5.0	8.0	5.0	7.0	2.0	1.0	9.0	9.0	9.3	9.0
SBL	2.0	3.0	10.0	2.0	5.0	1.0	1.0	8.0	7.3	6.0
SPD	2.0	2.0	10.0	2.0	6.0	2.0	1.0	8.0	6.7	4.0
SPP	2.0	2.0	10.0	2.0	8.0	4.0	1.0	8.0	7.3	6.0
TB	3.0	7.0	10.0	2.0	6.0	2.0	7.0	3.0	7.3	6.0
TP	3.0	7.0	10.0	2.0	5.0	2.0	7.0	7.0	8.0	7.0
TT	3.0	7.0	10.0	2.0	6.0	2.0	7.0	5.0	8.0	7.0
VDL	5.0	8.0	5.0	7.0	3.0	1.0	9.0	9.0	9.3	9.0
VDR	5.0	8.0	5.0	7.0	2.0	1.0	9.0	9.0	9.3	9.0

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	5.0	2.0	2.0	7.0	6.0	8.7	8.0
BW	10.0	10.0	5.0	6.0	1.0	1.0	7.0	9.0	9.3	9.0
HDA	10.0	10.0	10.0	0.0	4.0	2.0	0.0	8.0	8.0	9.0
HDL	10.0	10.0	5.0	4.0	2.0	1.0	7.0	9.0	9.3	9.0
HDR	10.0	10.0	5.0	4.0	2.0	1.0	7.0	9.0	9.3	9.0
SBL	10.0	10.0	10.0	0.0	7.0	3.0	0.0	8.0	8.0	7.0
SPD	10.0	10.0	10.0	0.0	7.0	4.0	0.0	7.0	6.7	5.0
SPP	10.0	10.0	10.0	0.0	9.0	5.0	0.0	7.0	7.3	6.0
TB	10.0	10.0	10.0	0.0	5.0	2.0	7.0	3.0	7.3	6.0
TP	10.0	10.0	10.0	0.0	4.0	2.0	7.0	6.0	8.7	8.0
TT	10.0	10.0	10.0	0.0	5.0	2.0	7.0	5.0	8.0	7.0
VDL	10.0	10.0	5.0	4.0	2.0	1.0	7.0	9.0	9.3	9.0
VDR	10.0	10.0	5.0	4.0	2.0	1.0	7.0	9.0	9.3	9.0

TABLE 2. CONTINUED

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.0	4.0	10.0	4.0	10.0	10.0	6.0	6.0	6.0	6.0
BW	3.0	10.0	3.0	6.0	1.0	1.0	9.0	9.0	8.7	9.0
HDA	1.0	5.0	10.0	2.0	2.0	1.0	8.0	9.0	7.3	8.0
HDL	3.0	8.0	3.0	6.0	1.0	1.0	9.0	9.0	8.7	9.0
HDR	3.0	8.0	3.0	6.0	1.0	1.0	9.0	9.0	8.7	9.0
SBL	1.0	3.0	10.0	0.0	4.0	1.0	1.0	8.0	4.7	2.0
SPD	1.0	3.0	10.0	0.0	6.0	2.0	1.0	8.0	4.0	1.0
SPP	1.0	3.0	10.0	0.0	8.0	4.0	1.0	8.0	4.7	2.0
TB	2.0	5.0	10.0	0.0	6.0	2.0	7.0	3.0	8.0	6.0
TP	2.0	5.0	10.0	0.0	5.0	2.0	7.0	7.0	8.7	8.0
TT	2.0	5.0	10.0	0.0	6.0	2.0	7.0	5.0	8.7	7.0
VDL	3.0	6.0	3.0	6.0	1.0	1.0	9.0	9.0	8.7	9.0
VDR	3.0	6.0	3.0	6.0	1.0	1.0	9.0	9.0	8.7	9.0

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	3.0	10.0	2.0	10.0	10.0	6.0	6.0	4.7	5.0
BW	9.0	9.0	3.0	6.0	2.0	1.0	9.0	9.0	8.0	8.0
HDA	4.0	4.0	10.0	2.0	3.0	1.0	8.0	9.0	6.7	7.0
HDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.0	8.0
HDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.0	8.0
SBL	2.0	3.0	10.0	0.0	3.0	1.0	1.0	8.0	4.0	1.0
SPD	2.0	3.0	10.0	0.0	6.0	2.0	1.0	8.0	3.3	0.0
SPP	2.0	3.0	10.0	0.0	8.0	4.0	1.0	8.0	4.0	1.0
TB	3.0	5.0	10.0	0.0	4.0	2.0	7.0	3.0	7.3	6.0
TP	3.0	5.0	10.0	0.0	3.0	2.0	7.0	7.0	8.0	7.0
TT	3.0	5.0	10.0	0.0	5.0	2.0	7.0	5.0	8.0	6.0
VDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.0	8.0
VDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.0	8.0

TABLE 2. CONTINUED.

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	3.0	10.0	2.0	10.0	10.0	6.0	6.0	5.3	6.0
BW	9.0	9.0	3.0	6.0	2.0	1.0	9.0	9.0	8.7	9.0
HDA	4.0	5.0	10.0	2.0	3.0	1.0	8.0	9.0	7.3	8.0
HDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.7	9.0
HDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.7	9.0
SBL	2.0	3.0	10.0	0.0	3.0	1.0	1.0	8.0	4.7	2.0
SPD	2.0	3.0	10.0	0.0	6.0	2.0	1.0	8.0	4.0	1.0
SPP	2.0	3.0	10.0	0.0	8.0	4.0	1.0	8.0	4.7	2.0
TB	3.0	5.0	10.0	0.0	4.0	2.0	7.0	3.0	8.0	6.0
TP	3.0	5.0	10.0	0.0	4.0	2.0	7.0	7.0	8.7	8.0
TT	3.0	5.0	10.0	0.0	5.0	2.0	7.0	5.0	8.7	7.0
VDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.7	9.0
VDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.7	9.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	5.0	10.0	2.0	10.0	10.0	6.0	6.0	7.3	7.0
BW	7.0	9.0	3.0	6.0	2.0	1.0	9.0	9.0	9.3	9.0
HDA	4.0	7.0	10.0	2.0	3.0	1.0	8.0	9.0	8.0	8.0
HDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0
HDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0
SBL	2.0	5.0	10.0	0.0	3.0	1.0	1.0	8.0	6.7	5.0
SPD	2.0	5.0	10.0	0.0	6.0	2.0	1.0	8.0	6.0	4.0
SPP	2.0	5.0	10.0	0.0	8.0	4.0	1.0	8.0	6.7	5.0
TB	4.0	7.0	10.0	0.0	3.0	2.0	7.0	2.0	8.0	6.0
TP	4.0	7.0	10.0	0.0	4.0	2.0	7.0	7.0	8.7	8.0
TT	4.0	7.0	10.0	0.0	5.0	2.0	7.0	4.0	8.7	7.0
VDL	7.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0
VDR	7.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0

TABLE 2. CONTINUED.

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	5.0	10.0	2.0	10.0	10.0	6.0	6.0	8.0	8.0
BW	4.0	10.0	3.0	6.0	2.0	1.0	9.0	9.0	9.3	9.0
HDA	3.0	6.0	10.0	2.0	3.0	1.0	8.0	9.0	8.7	9.0
HDL	4.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0
HDR	4.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0
SBL	1.0	4.0	10.0	0.0	4.0	1.0	1.0	8.0	6.7	5.0
SPD	1.0	4.0	10.0	0.0	6.0	2.0	1.0	8.0	6.7	4.0
SPP	1.0	4.0	10.0	0.0	8.0	4.0	1.0	8.0	6.7	5.0
TB	3.0	7.0	10.0	0.0	6.0	2.0	7.0	3.0	7.3	6.0
TP	3.0	7.0	10.0	0.0	6.0	2.0	7.0	7.0	8.0	7.0
TT	3.0	7.0	10.0	0.0	6.0	2.0	7.0	5.0	8.0	7.0
VDL	4.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0
VDR	4.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	5.0	10.0	2.0	10.0	10.0	6.0	6.0	8.0	8.0
BW	4.0	10.0	3.0	6.0	2.0	1.0	9.0	9.0	9.3	9.0
HDA	3.0	6.0	10.0	2.0	3.0	1.0	8.0	9.0	8.7	9.0
HDL	4.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0
HDR	4.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0
SBL	1.0	4.0	10.0	0.0	4.0	1.0	1.0	8.0	6.7	5.0
SPD	1.0	4.0	10.0	0.0	6.0	2.0	1.0	8.0	6.7	4.0
SPP	1.0	4.0	10.0	0.0	8.0	4.0	1.0	8.0	6.7	5.0
TB	3.0	7.0	10.0	0.0	6.0	2.0	7.0	3.0	7.3	6.0
TP	3.0	7.0	10.0	0.0	5.0	2.0	7.0	7.0	8.0	7.0
TT	3.0	7.0	10.0	0.0	6.0	2.0	7.0	5.0	8.0	7.0
VDL	4.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	9.3	9.0
VDR	4.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	9.3	9.0

TABLE 2. CONTINUED.

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	5.0	2.0	2.0	7.0	6.0	8.7	8.0
BW	10.0	10.0	5.0	6.0	1.0	1.0	7.0	9.0	9.3	9.0
HDA	10.0	10.0	10.0	0.0	4.0	2.0	0.0	8.0	8.0	9.0
HDL	10.0	10.0	5.0	4.0	1.0	1.0	7.0	9.0	9.3	9.0
HDR	10.0	10.0	5.0	4.0	1.0	1.0	7.0	9.0	9.3	9.0
SBL	10.0	10.0	10.0	0.0	7.0	3.0	0.0	8.0	8.0	7.0
SPD	10.0	10.0	10.0	0.0	7.0	4.0	0.0	7.0	6.7	5.0
SPP	10.0	10.0	10.0	0.0	9.0	5.0	0.0	7.0	7.3	6.0
TB	10.0	10.0	10.0	0.0	3.0	2.0	7.0	3.0	7.3	6.0
TP	10.0	10.0	10.0	0.0	2.0	2.0	7.0	6.0	8.0	8.0
TT	10.0	10.0	10.0	0.0	5.0	2.0	7.0	5.0	8.7	7.0
VDL	10.0	10.0	5.0	4.0	1.0	1.0	7.0	9.0	9.3	9.0
VDR	10.0	10.0	5.0	4.0	1.0	1.0	7.0	9.0	9.3	9.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.0	3.0	10.0	2.0	10.0	10.0	6.0	6.0	6.0	6.0
BW	3.0	9.0	3.0	4.0	2.0	1.0	9.0	9.0	8.7	9.0
HDA	1.0	5.0	10.0	2.0	3.0	1.0	8.0	9.0	7.3	8.0
HDL	3.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.7	9.0
HDR	3.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.7	9.0
SBL	1.0	3.0	10.0	0.0	4.0	1.0	1.0	8.0	4.7	2.0
SPD	1.0	3.0	10.0	0.0	6.0	2.0	1.0	8.0	4.0	1.0
SPP	1.0	3.0	10.0	0.0	8.0	4.0	1.0	8.0	4.7	2.0
TB	2.0	5.0	10.0	0.0	6.0	2.0	7.0	3.0	8.0	6.0
TP	2.0	5.0	10.0	0.0	5.0	2.0	7.0	7.0	8.7	8.0
TT	2.0	5.0	10.0	0.0	6.0	2.0	7.0	5.0	8.7	7.0
VDL	3.0	8.0	5.0	4.0	1.0	1.0	9.0	9.0	8.7	9.0
VDR	3.0	8.0	5.0	4.0	2.0	1.0	9.0	9.0	8.7	9.0

WHO: DO

SITE: CCFIN

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	9.0	10.0	10.0	7.0	5.0	10.0	8.0	4.0	0.0
SPD	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	3.3	0.0
SPP	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	3.3	0.0

TABLE 2. CONTINUED.

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDA	8.0	8.0	2.0	8.0	5.0	5.0	10.0	8.0	9.3	0.0
HDL	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
SBL	5.0	5.0	10.0	6.0	4.0	2.0	3.0	8.0	7.3	0.0
SPD	5.0	5.0	10.0	6.0	9.0	8.0	3.0	8.0	6.7	0.0
SPP	5.0	5.0	10.0	6.0	9.0	8.0	3.0	8.0	6.7	0.0
TB	5.0	5.0	10.0	6.0	5.0	5.0	3.0	8.0	9.3	0.0
TP	5.0	5.0	10.0	6.0	5.0	5.0	3.0	6.0	8.0	0.0
TT	5.0	5.0	10.0	6.0	5.0	5.0	3.0	8.0	9.3	0.0
VDL	2.0	5.0	2.0	6.0	5.0	3.0	5.0	8.0	9.3	0.0

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	9.0	10.0	10.0	7.0	5.0	10.0	8.0	7.3	0.0
SPD	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	7.3	0.0
SPP	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	7.3	0.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDA	8.0	8.0	2.0	8.0	5.0	5.0	10.0	8.0	9.3	0.0
HDL	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
SBL	5.0	5.0	10.0	2.0	4.0	2.0	3.0	8.0	7.3	0.0
SPD	5.0	5.0	10.0	2.0	9.0	8.0	3.0	8.0	6.7	0.0
SPP	5.0	5.0	10.0	2.0	9.0	8.0	3.0	8.0	6.7	0.0
TB	5.0	5.0	10.0	2.0	5.0	5.0	3.0	8.0	9.3	0.0
TP	5.0	5.0	10.0	2.0	5.0	5.0	3.0	7.0	9.3	0.0
TT	5.0	5.0	10.0	2.0	5.0	5.0	3.0	8.0	9.3	0.0
VDL	2.0	5.0	2.0	6.0	5.0	3.0	5.0	8.0	9.3	0.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	3.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDA	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	6.7	0.0
HDL	3.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	6.7	0.0
HDR	3.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	6.7	0.0
SBL	1.0	3.0	10.0	2.0	7.0	2.0	3.0	8.0	7.3	0.0
SPD	1.0	3.0	10.0	2.0	9.0	8.0	3.0	8.0	7.3	0.0
SPP	1.0	3.0	10.0	2.0	9.0	8.0	3.0	8.0	7.3	0.0
TB	2.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TT	2.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
VDL	3.0	5.0	2.0	6.0	5.0	3.0	5.0	8.0	6.7	0.0

VDR	3.0	5.0	2.0	6.0	5.0	3.0	9.0	8.0	6.7	0.0

TABLE 2. CONTINUED

SITE: SACUP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TT	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDL	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
HDR	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
TB	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TP	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TT	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
VDL	2.0	5.0	2.0	6.0	5.0	3.0	5.0	8.0	9.3	0.0
VDR	2.0	5.0	2.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	2.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDL	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
HDR	2.0	5.0	1.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0
TB	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TP	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
TT	1.0	5.0	2.0	2.0	5.0	5.0	9.0	8.0	9.3	0.0
VDL	2.0	5.0	2.0	6.0	5.0	3.0	5.0	8.0	9.3	0.0
VDR	2.0	5.0	2.0	6.0	5.0	3.0	9.0	8.0	9.3	0.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	9.0	10.0	10.0	7.0	5.0	10.0	8.0	6.7	0.0
SPD	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	6.0	0.0
SPP	9.0	9.0	10.0	10.0	9.5	8.0	10.0	8.0	6.0	0.0

TABLE 2. CONTINUED.

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	6.0	1.0	6.0	3.0	3.0	9.0	8.0	9.3	0.0
HDA	4.0	6.0	2.0	4.0	5.0	5.0	10.0	8.0	8.7	0.0
HDL	1.0	5.0	1.0	5.0	5.0	5.0	10.0	8.0	9.3	0.0
SBL	2.0	4.0	10.0	1.0	3.0	1.0	3.0	8.0	6.7	0.0
SPD	2.0	4.0	10.0	1.0	9.0	8.0	3.0	8.0	6.0	0.0
SPP	2.0	4.0	10.0	1.0	9.0	8.0	3.0	8.0	6.0	0.0
TB	1.0	5.0	10.0	2.0	5.0	5.0	3.0	8.0	9.3	0.0
TP	1.0	5.0	10.0	2.0	5.0	5.0	3.0	7.0	9.3	0.0
TT	1.0	5.0	10.0	2.0	5.0	5.0	3.0	8.0	9.3	0.0
VDL	1.0	5.0	2.0	5.0	5.0	3.0	5.0	8.0	9.3	0.0

WHO: GE

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	8.0	10.0	5.0	5.0	5.0	2.0	10.0	8.0	10.0	8.0
BW	8.0	10.0	5.0	5.0	2.0	2.0	10.0	8.0	10.0	9.0
HDA	8.0	10.0	5.0	5.0	5.0	5.0	10.0	2.0	10.0	4.0
HDL	8.0	10.0	3.0	10.0	3.0	3.0	10.0	4.0	10.0	5.0
HDR	8.0	10.0	3.0	10.0	3.0	3.0	10.0	4.0	10.0	5.0
SBL	8.0	10.0	10.0	5.0	7.0	7.0	5.0	5.0	10.0	0.0
SPD	8.0	10.0	10.0	3.0	10.0	10.0	10.0	8.0	10.0	3.0
SPP	8.0	10.0	10.0	5.0	10.0	8.0	5.0	5.0	10.0	0.0
TB	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	2.0
TP	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	9.0
TT	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	2.0
VDL	8.0	10.0	5.0	10.0	5.0	3.0	10.0	5.0	10.0	5.0
VDR	8.0	10.0	5.0	5.0	5.0	3.0	10.0	5.0	10.0	5.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	8.0	10.0	5.0	5.0	5.0	2.0	10.0	8.0	10.0	8.0
BW	8.0	10.0	5.0	5.0	2.0	2.0	10.0	8.0	10.0	9.0
HDA	8.0	10.0	5.0	5.0	5.0	5.0	10.0	2.0	10.0	4.0
HDL	8.0	10.0	3.0	10.0	3.0	3.0	10.0	4.0	10.0	5.0
HDR	8.0	10.0	3.0	10.0	3.0	3.0	10.0	4.0	10.0	5.0
SBL	8.0	10.0	10.0	5.0	7.0	7.0	5.0	5.0	10.0	0.0
SPD	8.0	10.0	10.0	7.0	10.0	10.0	10.0	8.0	10.0	3.0
SPP	8.0	10.0	10.0	5.0	10.0	8.0	5.0	5.0	10.0	0.0
TB	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	2.0
TP	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	9.0
TT	8.0	10.0	10.0	5.0	8.0	8.0	6.0	5.0	10.0	2.0
VDL	8.0	10.0	5.0	10.0	5.0	3.0	10.0	5.0	10.0	5.0

VDR	8.0	10.0	5.0	5.0	5.0	3.0	10.0	5.0	10.0	5.0

TABLE 2. CONTINUED.

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	10.0	10.0	10.0	0.0	7.0	10.0	0.0	8.0	10.0	0.0
SPD	10.0	10.0	10.0	0.0	10.0	10.0	0.0	8.0	10.0	0.0
SPP	10.0	10.0	10.0	0.0	10.0	10.0	0.0	8.0	10.0	0.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	10.0	2.0	10.0	2.0	2.0	10.0	2.0	9.3	5.0
HDA	2.0	2.0	5.0	8.0	5.0	2.0	10.0	2.0	9.3	5.0
HDL	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
HDR	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
VDL	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
VDR	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	2.0	10.0	2.0	10.0	2.0	2.0	10.0	2.0	9.3	5.0
HDA	2.0	2.0	5.0	5.0	5.0	2.0	10.0	2.0	9.3	5.0
HDL	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
HDR	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
VDL	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0
VDR	2.0	2.0	5.0	10.0	5.0	2.0	10.0	2.0	9.3	5.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	8.0	10.0	5.0	0.0	5.0	2.0	10.0	8.0	10.0	8.0
BW	8.0	10.0	5.0	0.0	2.0	2.0	10.0	8.0	10.0	9.0
HDA	8.0	10.0	5.0	0.0	5.0	5.0	10.0	2.0	10.0	4.0
HDL	8.0	10.0	3.0	0.0	3.0	3.0	10.0	4.0	10.0	5.0
HDR	8.0	10.0	3.0	0.0	3.0	3.0	10.0	4.0	10.0	5.0
SBL	8.0	10.0	10.0	0.0	6.0	7.0	5.0	5.0	10.0	0.0
SPD	8.0	10.0	10.0	0.0	10.0	10.0	10.0	8.0	10.0	3.0
SPP	8.0	10.0	10.0	0.0	10.0	8.0	5.0	5.0	10.0	0.0
TB	8.0	10.0	10.0	0.0	8.0	8.0	6.0	5.0	10.0	2.0
TP	8.0	10.0	10.0	0.0	8.0	8.0	6.0	5.0	10.0	9.0
TT	8.0	10.0	10.0	0.0	8.0	8.0	6.0	5.0	10.0	2.0
VDL	8.0	10.0	5.0	0.0	5.0	3.0	10.0	5.0	10.0	5.0
VDR	8.0	10.0	5.0	0.0	5.0	3.0	10.0	5.0	10.0	5.0

TABLE 2. CONTINUED.

WHO: JG

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	1.0	10.0	10.0	2.0	10.0	10.0	1.0
BW	9.0	0.0	2.5	5.0	0.0	0.0	8.0	7.0	8.7	9.0
HDA	9.0	10.0	5.0	1.0	7.0	5.0	3.0	5.0	9.3	4.0
HDL	9.0	0.0	1.0	5.0	0.0	0.0	8.0	6.0	9.3	5.0
HDR	9.0	0.0	1.0	5.0	0.0	0.0	8.0	6.0	9.3	5.0
SBL	9.0	8.0	10.0	1.0	6.0	5.0	2.0	3.0	6.7	1.0
SPD	9.0	8.0	10.0	1.0	7.0	6.0	2.0	3.0	4.0	1.0
SPP	9.0	8.0	10.0	1.0	8.0	6.0	2.0	3.0	4.7	1.0
TB	9.0	10.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	7.0	8.0	5.0	7.0	3.0	2.0	10.0	8.0	9.3	8.0
TT	9.0	10.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	9.0	0.0	2.5	5.0	0.0	0.0	8.0	6.0	9.3	5.0
VDR	9.0	0.0	2.5	5.0	0.0	0.0	8.0	6.0	9.3	5.0

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	9.0	0.0	10.0	10.0	10.0	8.0	10.0	10.0	8.7	1.0
BW	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	9.0
HDA	9.0	0.0	5.0	10.0	0.0	0.0	10.0	10.0	9.3	4.0
HDL	9.0	0.0	1.0	10.0	0.0	0.0	10.0	10.0	9.3	5.0
HDR	9.0	0.0	1.0	10.0	0.0	0.0	10.0	10.0	9.3	5.0
SBL	9.0	5.0	10.0	10.0	8.0	6.0	10.0	10.0	8.0	1.0
SPD	9.0	5.0	10.0	10.0	8.0	6.0	10.0	10.0	5.3	1.0
SPP	9.0	5.0	10.0	10.0	9.0	7.0	10.0	10.0	6.0	1.0
TB	9.0	7.0	5.0	8.5	8.0	6.0	10.0	9.0	9.3	8.0
TP	9.0	4.0	5.0	7.0	7.0	6.0	9.0	8.0	9.3	8.0
TT	9.0	9.0	5.0	9.0	8.0	6.0	10.0	8.0	9.3	8.0
VDL	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	5.0
VDR	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	5.0

TABLE 2. CONTINUED.

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	4.0	5.0	10.0	1.0	10.0	8.0	2.0	3.0	4.7	1.0
BW	7.0	7.0	2.5	5.0	6.0	5.0	8.0	7.0	8.7	9.0
HDA	7.0	7.0	6.0	1.0	7.0	6.0	4.0	5.0	9.3	4.0
HDL	7.0	7.0	1.0	5.0	5.0	4.0	8.0	6.0	9.3	5.0
HDR	7.0	0.0	1.0	5.0	0.0	0.0	8.0	6.0	9.3	5.0
SBL	4.0	5.0	10.0	1.0	6.0	5.0	2.0	3.0	6.7	1.0
SPD	4.0	5.0	10.0	1.0	7.0	6.0	2.0	3.0	4.0	1.0
SPP	4.0	5.0	10.0	1.0	8.0	6.0	2.0	3.0	4.7	1.0
TB	9.0	10.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	5.0	8.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	10.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	7.0	7.0	2.5	5.0	7.0	6.0	8.0	6.0	9.3	5.0
VDR	7.0	0.0	2.5	5.0	0.0	0.0	8.0	6.0	9.3	5.0

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	7.0	7.0	10.0	3.0	10.0	8.0	5.0	3.0	9.3	1.0
BW	6.0	1.0	2.5	5.0	1.0	1.0	8.0	7.0	9.3	9.0
HDA	4.0	4.0	5.0	1.0	3.0	2.0	5.0	3.0	8.7	4.0
HDL	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
HDR	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
SBL	4.0	1.0	10.0	1.0	2.0	2.0	4.0	3.0	8.7	1.0
SPD	4.0	1.0	10.0	1.0	2.0	2.0	4.0	3.0	6.0	1.0
SPP	4.0	1.0	10.0	1.0	2.0	2.0	4.0	3.0	6.7	1.0
TB	9.0	9.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	6.0	7.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	9.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
VDR	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0

TABLE 2. CONTINUED.

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	7.0	7.0	10.0	3.0	10.0	8.0	4.0	3.0	9.3	1.0
BW	6.0	1.0	2.5	5.0	1.0	1.0	8.0	7.0	9.3	9.0
HDA	4.0	4.0	5.0	1.0	3.0	2.0	4.0	3.0	8.7	4.0
HDL	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
HDR	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
SBL	4.0	1.0	10.0	1.0	2.0	2.0	3.0	3.0	8.7	1.0
SPD	4.0	1.0	10.0	1.0	2.0	2.0	3.0	3.0	6.0	1.0
SPP	4.0	1.0	10.0	1.0	2.0	2.0	3.0	3.0	6.7	1.0
TB	9.0	9.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	6.0	7.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	9.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
VDR	6.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	8.0	8.0	10.0	3.0	10.0	8.0	5.0	3.0	9.3	1.0
BW	8.0	1.0	2.5	5.0	1.0	1.0	8.0	7.0	9.3	9.0
HDA	6.0	6.0	10.0	1.0	2.0	2.0	3.0	3.0	9.3	4.0
HDL	8.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
HDR	8.0	1.0	2.5	5.0	0.0	0.0	8.0	6.0	9.3	5.0
SBL	6.0	2.0	10.0	1.0	6.0	5.0	2.0	3.0	9.3	1.0
SPD	6.0	2.0	10.0	1.0	7.0	6.0	2.0	3.0	8.7	1.0
SPP	6.0	2.0	10.0	1.0	8.0	6.0	2.0	3.0	8.7	1.0
TB	9.0	10.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	5.0	5.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	10.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	8.0	1.0	2.5	5.0	1.0	1.0	8.0	6.0	9.3	5.0
VDR	8.0	1.0	2.5	5.0	0.0	0.0	8.0	6.0	9.3	5.0

TABLE 2. CONTINUED.

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	1.0	10.0	1.0	1.0	1.0	2.0	3.0	4.7	1.0
BW	7.0	5.0	2.5	5.0	3.0	2.0	8.0	7.0	8.7	9.0
HDA	2.0	2.0	3.0	1.0	5.0	4.0	3.0	5.0	8.7	4.0
HDL	7.0	5.5	1.0	5.0	3.0	2.0	8.0	6.0	9.3	5.0
HDR	7.0	7.0	1.0	5.0	4.0	3.0	8.0	6.0	9.3	5.0
SBL	2.0	2.0	10.0	1.0	6.0	5.0	2.0	3.0	6.0	1.0
SPD	2.0	1.0	10.0	1.0	7.0	6.0	2.0	3.0	2.0	1.0
SPP	2.0	1.5	10.0	1.0	8.0	6.0	2.0	3.0	3.3	1.0
TB	9.0	10.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	5.0	8.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	10.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	7.0	5.5	2.5	5.0	2.5	2.0	8.0	6.0	9.3	5.0
VDR	7.0	7.0	2.5	5.0	3.5	3.0	8.0	6.0	9.3	5.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	1.0	10.0	1.0	1.0	1.0	2.0	3.0	4.7	1.0
BW	7.0	5.0	2.5	5.0	3.0	2.0	8.0	7.0	8.7	9.0
HDA	2.0	2.0	3.0	1.0	5.0	4.0	3.0	5.0	8.7	4.0
HDL	4.0	4.5	1.0	5.0	3.0	2.0	8.0	6.0	9.3	5.0
HDR	7.0	7.0	1.0	5.0	4.0	3.0	8.0	6.0	9.3	5.0
SBL	2.0	2.0	10.0	1.0	6.0	5.0	2.0	3.0	6.0	1.0
SPD	2.0	1.0	10.0	1.0	7.0	6.0	2.0	3.0	2.0	1.0
SPP	2.0	1.5	10.0	1.0	8.0	6.0	2.0	3.0	3.3	1.0
TB	9.0	10.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	5.0	8.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	10.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	4.0	4.5	2.5	5.0	2.5	2.0	8.0	6.0	9.3	5.0
VDR	7.0	7.0	2.5	5.0	3.5	3.0	8.0	6.0	9.3	5.0

TABLE 2. CONTINUED.

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	9.0	0.0	10.0	10.0	10.0	8.0	10.0	10.0	8.7	1.0
BW	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	9.0
HDA	9.0	0.0	5.0	10.0	0.0	0.0	10.0	10.0	9.3	4.0
HDL	9.0	0.0	1.0	10.0	0.0	0.0	10.0	10.0	9.3	5.0
HDR	9.0	0.0	1.0	10.0	0.0	0.0	10.0	10.0	9.3	5.0
SBL	9.0	2.0	10.0	10.0	8.0	6.0	10.0	10.0	7.3	1.0
SPD	9.0	2.0	10.0	10.0	8.0	6.0	10.0	10.0	4.0	1.0
SPP	9.0	2.0	10.0	10.0	9.0	7.0	10.0	10.0	4.7	1.0
TB	9.0	7.0	5.0	8.5	8.0	6.0	10.0	9.0	9.3	8.0
TP	9.0	4.0	5.0	7.0	7.0	6.0	9.0	8.0	9.3	8.0
TT	9.0	9.0	5.0	9.0	8.0	6.0	10.0	8.0	9.3	8.0
VDL	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	5.0
VDR	9.0	0.0	2.5	10.0	0.0	0.0	10.0	10.0	9.3	5.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	4.0	10.0	1.0	10.0	8.0	7.0	2.0	4.0	1.0
BW	7.0	6.0	2.5	5.0	2.0	2.0	9.0	6.0	9.3	9.0
HDA	4.0	3.0	7.0	1.0	3.0	2.0	8.0	4.0	8.7	4.0
HDL	7.0	6.0	2.0	5.0	2.0	2.0	9.0	5.0	9.3	5.0
HDR	6.0	0.0	2.0	5.0	0.0	0.0	9.0	5.0	9.3	5.0
SBL	2.0	2.0	10.0	1.0	3.0	2.0	7.0	2.0	5.3	1.0
SPD	2.0	1.0	10.0	1.0	3.0	2.0	7.0	2.0	2.0	1.0
SPP	2.0	1.5	10.0	1.0	3.0	2.0	7.0	2.0	2.7	1.0
TB	9.0	9.0	5.0	8.5	4.5	4.0	10.0	9.0	9.3	8.0
TP	5.0	7.0	5.0	7.0	3.0	2.0	9.0	8.0	9.3	8.0
TT	9.0	9.0	5.0	9.0	4.0	3.0	10.0	8.0	9.3	8.0
VDL	7.0	6.0	2.5	5.0	2.0	2.0	9.0	5.0	9.3	5.0
VDR	6.0	0.0	2.5	5.0	0.0	0.0	9.0	5.0	9.3	5.0

TABLE 2. CONTINUED.

WHO: JS

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	3.0	5.0	5.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
SPD	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	7.3	6.0
SPP	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	9.0	9.5
HDA	3.0	5.0	5.0	2.0	0.0	0.0	0.0	0.0	9.0	8.5
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	8.5
SBL	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	9.0	8.5
SPD	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	8.7	8.0
SPP	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	9.0	8.5
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	8.0

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

TABLE 2. CONTINUED.

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
BW	7.0	8.0	5.0	5.0	0.0	0.0	0.0	0.0	9.7	9.5
HDA	6.0	8.0	5.0	0.0	0.0	0.0	0.0	0.0	9.7	9.0
HDL	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
HDR	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
SBL	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
SPD	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.0	8.5
SPP	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
VDL	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
VDR	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	0.1	5.0	5.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	0.1	7.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	6.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
HDR	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
SPD	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0
VDR	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

TABLE 2. CONTINUED.

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	0.1	5.0	5.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	0.1	7.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	6.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
HDR	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
SPD	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0
VDR	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	9.0	10.0	10.0	0.0	0.0	0.0	0.0	6.7	5.0
SPD	9.0	1.0	10.0	10.0	0.0	0.0	0.0	0.0	4.7	2.0
SPP	9.0	9.0	10.0	10.0	0.0	0.0	0.0	0.0	6.7	5.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.0	3.0	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	1.0	3.0	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

TABLE 2. CONTINUED.

WHO: LS

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	3.0	5.0	5.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
SPD	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	7.3	6.0
SPP	3.0	5.0	10.0	2.0	0.0	0.0	0.0	0.0	8.0	7.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	9.0	9.5
HDA	3.0	5.0	5.0	2.0	0.0	0.0	0.0	0.0	9.0	8.5
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	8.5
SBL	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	9.0	8.5
SPD	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	8.7	8.0
SPP	3.0	5.0	10.0	1.0	0.0	0.0	0.0	0.0	9.0	8.5
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	8.0

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

TABLE 2. CONTINUED.

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
BW	7.0	8.0	5.0	5.0	0.0	0.0	0.0	0.0	9.7	9.5
HDA	6.0	8.0	5.0	0.0	0.0	0.0	0.0	0.0	9.7	9.0
HDL	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
HDR	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
SBL	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
SPD	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.0	8.5
SPP	6.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	9.3	9.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	9.0
VDL	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0
VDR	6.0	8.0	5.0	9.0	0.0	0.0	0.0	0.0	9.7	9.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	0.1	5.0	5.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	0.1	7.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	6.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
HDR	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
SPD	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0
VDR	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

TABLE 2. CONTINUED.

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	0.1	5.0	5.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
BW	5.0	8.0	3.0	9.0	0.0	0.0	0.0	0.0	8.0	9.0
HDA	0.1	7.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	6.0
HDL	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
HDR	5.0	7.0	2.0	9.0	0.0	0.0	0.0	0.0	7.3	7.0
SBL	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
SPD	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	0.1	5.0	10.0	0.0	0.0	0.0	0.0	0.0	1.3	2.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
VDL	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0
VDR	5.0	7.0	3.0	9.0	0.0	0.0	0.0	0.0	6.0	6.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	9.0	9.0	10.0	10.0	0.0	0.0	0.0	0.0	6.7	5.0
SPD	9.0	1.0	10.0	10.0	0.0	0.0	0.0	0.0	4.7	2.0
SPP	9.0	9.0	10.0	10.0	0.0	0.0	0.0	0.0	6.7	5.0
TB	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TP	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0
TT	10.0	10.0	7.0	9.0	0.0	0.0	0.0	0.0	9.3	8.0

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	1.0	3.0	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
SPP	1.0	3.0	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
TB	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TP	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0
TT	10.0	10.0	2.0	9.0	0.0	0.0	0.0	0.0	8.7	6.0

TABLE 2. CONTINUED.

WHO: MK

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDA	1.0	10.0	2.0	0.0	3.0	3.0	9.0	9.0	6.7	3.0
HDL	3.0	10.0	1.0	4.0	1.0	1.0	9.0	9.0	8.0	5.0
SBL	5.0	10.0	10.0	0.0	6.0	2.0	7.0	4.0	8.7	7.0
SPD	5.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	7.3	5.0
SPP	5.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	7.3	5.0
TB	3.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	0.0
TP	1.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	6.0	2.0
TT	3.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	2.0
VDL	3.0	10.0	3.0	4.0	3.0	3.0	9.0	6.0	8.7	7.0

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	10.0	10.0	10.0	9.0	6.0	2.0	9.0	6.0	8.7	7.0
SPD	10.0	10.0	10.0	9.0	9.0	6.0	9.0	6.0	7.3	5.0
SPP	10.0	10.0	10.0	9.0	9.0	6.0	9.0	6.0	7.3	5.0
TB	10.0	10.0	0.0	9.0	0.0	6.0	9.0	0.0	7.3	0.0
TT	10.0	10.0	0.0	9.0	0.0	6.0	9.0	0.0	6.0	2.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	7.0	10.0	10.0	8.0	10.0	9.0	7.0	9.0	8.0	9.0
HDA	1.0	10.0	2.0	0.0	3.0	3.0	9.0	9.0	6.0	3.0
HDL	2.0	10.0	1.0	4.0	1.0	1.0	9.0	9.0	7.3	5.0
SBL	4.0	10.0	10.0	0.0	6.0	6.0	7.0	4.0	7.3	7.0
SPD	4.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	6.0	5.0
SPP	4.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	6.0	5.0
TB	3.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	0.0
TP	1.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	2.0
TT	2.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	6.0	4.0
VDL	2.0	10.0	3.0	4.0	3.0	3.0	9.0	6.0	8.0	7.0

TABLE 2. CONTINUED.

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	7.0	10.0	10.0	8.0	10.0	9.0	7.0	9.0	8.0	9.0
HDA	1.0	10.0	2.0	0.0	3.0	3.0	9.0	9.0	6.0	3.0
HDL	2.0	10.0	1.0	4.0	1.0	1.0	9.0	9.0	7.3	5.0
SBL	4.0	10.0	10.0	0.0	6.0	6.0	7.0	4.0	7.3	7.0
SPD	4.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	6.0	5.0
SPP	4.0	10.0	10.0	0.0	9.0	6.0	7.0	4.0	6.0	5.0
TB	3.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	0.0
TP	1.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	7.3	2.0
TT	2.0	10.0	0.0	1.0	0.0	6.0	4.0	7.0	6.0	4.0
VDL	2.0	10.0	3.0	4.0	3.0	3.0	9.0	6.0	8.0	7.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	6.0	10.0	1.0	7.0	0.0	4.0	9.0	8.0	9.3	9.0
HDA	1.0	10.0	2.0	0.0	3.0	3.0	9.0	9.0	6.7	3.0
HDL	3.0	10.0	1.0	4.0	1.0	1.0	9.0	9.0	8.0	5.0
VDL	3.0	10.0	3.0	4.0	3.0	3.0	9.0	6.0	8.7	7.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	6.0	10.0	1.0	7.0	0.0	4.0	9.0	8.0	9.3	9.0
HDA	1.0	10.0	2.0	0.0	3.0	3.0	9.0	9.0	6.7	3.0
HDL	3.0	10.0	1.0	4.0	1.0	1.0	9.0	9.0	8.0	5.0
VDL	3.0	10.0	3.0	4.0	3.0	3.0	9.0	6.0	8.7	7.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
SBL	10.0	10.0	10.0	9.0	6.0	2.0	9.0	6.0	8.7	7.0
SPD	10.0	10.0	10.0	9.0	9.0	6.0	9.0	6.0	7.3	5.0
SPP	10.0	10.0	10.0	9.0	9.0	6.0	9.0	6.0	7.3	5.0
TB	10.0	10.0	0.0	9.0	0.0	6.0	9.0	6.0	3.3	0.0
TT	10.0	10.0	0.0	9.0	0.0	6.0	9.0	4.0	4.7	0.0

TABLE 2. CONTINUED.

WHO: SR

SITE: CCFIN

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDL	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	4.7	1.0
HDR	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	4.7	1.0
SBL	10.0	10.0	10.0	10.0	5.0	5.0	10.0	9.0	4.7	2.0
TT	10.0	10.0	10.0	10.0	5.0	5.0	10.0	9.0	4.7	2.0

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	8.0	10.0	0.0	2.0	0.0	2.0	0.0	8.0	9.3	9.0
HDL	6.0	5.0	8.0	5.0	5.0	3.0	3.0	8.0	4.7	0.0
HDR	6.0	5.0	8.0	5.0	5.0	3.0	3.0	8.0	4.7	0.0
SBL	8.0	10.0	10.0	5.0	3.0	2.0	8.0	8.0	8.7	6.0
SPP	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.7	10.0
TB	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.0	0.0
TT	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.0	0.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BW	8.0	10.0	0.0	2.0	0.0	2.0	0.0	8.0	9.3	9.0
HDL	6.0	5.0	8.0	5.0	5.0	3.0	3.0	8.0	4.7	0.0
HDR	6.0	5.0	8.0	5.0	5.0	3.0	3.0	8.0	4.7	0.0
SBL	8.0	10.0	10.0	5.0	3.0	2.0	8.0	8.0	8.7	6.0
SPP	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.7	0.0
TB	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.0	0.0
TT	6.0	5.0	10.0	5.0	8.0	3.0	3.0	8.0	4.0	0.0

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	0.0	2.0	8.0	8.0	2.0	9.0	7.3	7.0
SBL	10.0	10.0	10.0	2.0	4.0	1.0	5.0	9.0	8.7	6.0
SPP	10.0	2.0	10.0	2.0	8.0	1.0	2.0	9.0	6.0	0.0
TB	10.0	2.0	10.0	2.0	8.0	1.0	2.0	9.0	6.0	0.0
TT	10.0	10.0	10.0	2.0	4.0	1.0	5.0	9.0	8.7	6.0

TABLE 2. CONTINUED.

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDL	8.0	7.0	7.0	8.0	0.5	1.0	8.0	2.0	6.0	0.0
HDR	8.0	5.0	2.0	10.0	0.5	1.0	10.0	5.0	8.0	0.0
VDL	8.0	7.0	4.0	8.0	0.5	1.0	8.0	2.0	6.0	0.0
VDR	8.0	5.0	2.0	10.0	0.5	1.0	10.0	5.0	8.0	0.0

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDL	8.0	7.0	7.0	8.0	0.5	1.0	8.0	2.0	6.0	0.0
HDR	8.0	5.0	2.0	10.0	0.5	1.0	10.0	5.0	8.0	0.0
VDL	8.0	7.0	4.0	8.0	0.5	1.0	8.0	2.0	6.0	0.0
VDR	8.0	5.0	2.0	10.0	0.5	1.0	10.0	5.0	8.0	0.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
HDL	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	6.0	3.0
HDR	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0	6.0	3.0
SBL	10.0	10.0	10.0	10.0	5.0	5.0	10.0	9.0	6.7	6.0
TT	10.0	10.0	10.0	10.0	5.0	5.0	10.0	9.0	6.7	6.0

WHO: SS

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	1.0	10.0	10.0	1.0	5.0	10.0	5.0
BW	5.0	9.0	4.0	4.0	3.0	3.0	4.0	6.0	7.3	8.0
HDA	2.0	8.0	5.0	1.0	3.0	3.0	3.0	7.0	8.0	8.0
HDL	5.0	9.0	3.0	5.0	2.0	2.0	5.0	8.0	8.7	8.0
HDR	5.0	9.0	3.0	5.0	2.0	2.0	5.0	8.0	8.7	8.0
SBL	2.0	8.0	10.0	1.0	3.0	2.0	1.0	6.0	7.3	7.0
SPD	2.0	8.0	10.0	1.0	9.0	9.0	1.0	6.0	6.7	6.0
SPP	2.0	8.0	10.0	1.0	9.0	8.0	1.0	6.0	7.3	7.0
TB	4.0	8.0	10.0	5.0	9.0	9.0	1.0	6.0	6.0	5.0
TP	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	5.3	6.0
TT	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	6.0	5.0
VDL	5.0	9.0	5.0	5.0	2.0	2.0	5.0	7.0	8.0	8.0
VDR	5.0	9.0	5.0	5.0	2.0	2.0	5.0	7.0	8.0	8.0

TABLE 2. CONTINUED.

SITE: CVP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	5.0	9.0	10.0	10.0	10.0	10.0	10.0	5.0	5.3	5.0
BW	5.0	9.0	4.0	4.0	3.0	3.0	4.0	6.0	7.3	8.0
HDA	8.0	5.0	5.0	10.0	3.0	3.0	10.0	6.0	8.0	8.0
HDL	8.0	6.0	3.0	10.0	2.0	2.0	10.0	6.0	8.0	8.0
HDR	8.0	6.0	3.0	10.0	2.0	2.0	10.0	7.0	8.7	8.0
SBL	10.0	10.0	10.0	10.0	3.0	2.0	10.0	5.0	10.0	7.0
SPD	8.0	8.0	10.0	10.0	9.0	9.0	10.0	5.0	6.0	6.0
SPP	8.0	8.0	10.0	10.0	9.0	8.0	10.0	5.0	6.7	7.0
TB	4.0	9.0	10.0	10.0	9.0	9.0	10.0	6.0	10.0	5.0
TP	4.0	9.0	10.0	10.0	9.0	9.0	10.0	2.0	8.0	6.0
TT	4.0	10.0	10.0	10.0	9.0	9.0	10.0	2.0	10.0	5.0
VDL	8.0	6.0	5.0	10.0	2.0	2.0	10.0	6.0	8.0	8.0
VDR	8.0	6.0	5.0	10.0	2.0	2.0	10.0	6.0	8.0	8.0

SITE: GEORG

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	9.0	10.0	1.0	10.0	10.0	1.0	5.0	5.3	5.0
BW	5.0	9.0	4.0	4.0	3.0	3.0	4.0	6.0	7.3	8.0
HDA	2.0	8.0	5.0	1.0	3.0	3.0	3.0	7.0	8.0	8.0
HDL	5.0	9.0	3.0	5.0	2.0	2.0	5.0	8.0	8.7	8.0
HDR	5.0	9.0	3.0	5.0	2.0	2.0	5.0	8.0	8.7	8.0
SBL	2.0	8.0	10.0	1.0	3.0	2.0	1.0	6.0	7.3	7.0
SPD	2.0	8.0	10.0	1.0	9.0	9.0	1.0	6.0	6.7	6.0
SPP	2.0	8.0	10.0	1.0	9.0	8.0	1.0	6.0	7.3	7.0
TB	4.0	8.0	10.0	5.0	9.0	9.0	1.0	6.0	6.0	5.0
TP	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	5.3	6.0
TT	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	6.0	5.0
VDL	5.0	9.0	5.0	5.0	2.0	2.0	5.0	7.0	8.0	8.0
VDR	5.0	9.0	5.0	5.0	2.0	2.0	5.0	7.0	8.7	8.0

TABLE 2. CONTINUED.

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	2.0	10.0	1.0	10.0	10.0	1.0	5.0	4.0	4.0
BW	2.0	2.0	4.0	5.0	5.0	5.0	5.0	7.0	6.0	8.0
HDA	2.0	2.0	5.0	1.0	3.0	3.0	3.0	7.0	6.0	6.0
HDL	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
HDR	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
SBL	2.0	2.0	10.0	1.0	3.0	3.0	1.0	6.0	5.3	6.0
SPD	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	4.7	5.0
SPP	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	5.3	5.0
TB	3.0	2.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	5.0
TP	3.0	2.0	5.0	4.0	5.0	5.0	5.0	2.0	5.3	6.0
TT	3.0	2.0	5.0	4.0	5.0	5.0	5.0	2.0	6.0	5.0
VDL	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0
VDR	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0

SITE: MOKEL

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	2.0	10.0	1.0	10.0	10.0	1.0	5.0	4.0	4.0
BW	2.0	2.0	4.0	5.0	5.0	5.0	5.0	7.0	6.0	8.0
HDA	2.0	2.0	5.0	1.0	3.0	3.0	3.0	7.0	6.0	6.0
HDL	5.0	3.0	3.0	5.0	3.0	3.0	5.0	8.0	7.3	7.0
HDR	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
SBL	2.0	2.0	10.0	1.0	3.0	3.0	1.0	6.0	5.3	6.0
SPD	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	4.7	5.0
SPP	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	5.3	5.0
TB	3.0	2.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	5.0
TP	3.0	2.0	5.0	4.0	5.0	5.0	5.0	2.0	5.3	6.0
TT	3.0	2.0	5.0	4.0	5.0	5.0	5.0	2.0	6.0	5.0
VDL	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0
VDR	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0

TABLE 2. CONTINUED.

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	9.0	10.0	1.0	10.0	10.0	1.0	5.0	6.0	7.0
BW	5.0	9.0	4.0	4.0	3.0	3.0	4.0	6.0	8.0	8.0
HDA	2.0	8.0	5.0	1.0	3.0	3.0	3.0	7.0	8.0	8.0
HDL	5.0	9.0	3.0	5.0	3.0	3.0	5.0	8.0	8.7	8.0
HDR	5.0	9.0	3.0	5.0	2.0	2.0	5.0	8.0	8.7	8.0
SBL	2.0	8.0	10.0	1.0	3.0	2.0	1.0	6.0	8.0	8.0
SPD	2.0	8.0	10.0	1.0	9.0	9.0	1.0	6.0	7.3	7.0
SPP	2.0	8.0	10.0	1.0	9.0	8.0	1.0	6.0	8.0	8.0
TB	4.0	8.0	10.0	5.0	9.0	9.0	1.0	6.0	6.7	6.0
TP	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	6.0	7.0
TT	4.0	8.0	10.0	5.0	9.0	9.0	1.0	2.0	6.7	6.0
VDL	5.0	9.0	5.0	5.0	3.0	2.0	5.0	7.0	8.7	8.0
VDR	5.0	9.0	5.0	5.0	2.0	2.0	5.0	7.0	8.7	8.0

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	2.0	10.0	1.0	10.0	10.0	1.0	5.0	4.0	4.0
BW	2.0	2.0	4.0	5.0	5.0	5.0	5.0	7.0	6.0	8.0
HDA	2.0	2.0	5.0	1.0	3.0	3.0	3.0	7.0	6.0	6.0
HDL	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
HDR	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
SBL	2.0	2.0	10.0	1.0	3.0	3.0	1.0	6.0	5.3	6.0
SPD	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	4.7	5.0
SPP	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	5.3	5.0
TB	3.0	3.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	5.0
TP	3.0	3.0	5.0	4.0	5.0	5.0	5.0	2.0	5.3	6.0
TT	3.0	3.0	5.0	4.0	5.0	5.0	5.0	2.0	6.0	5.0
VDL	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0
VDR	5.0	3.0	4.0	5.0	5.0	5.0	5.0	7.0	6.7	7.0

TABLE 2. CONTINUED.

SITE: SUTT

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	2.0	10.0	1.0	10.0	10.0	1.0	5.0	4.0	4.0
BW	2.0	2.0	4.0	5.0	5.0	5.0	5.0	7.0	6.0	8.0
HDA	2.0	2.0	5.0	1.0	3.0	3.0	3.0	7.0	6.0	6.0
HDL	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
HDR	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
SBL	2.0	2.0	10.0	1.0	3.0	3.0	1.0	6.0	5.3	6.0
SPD	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	4.7	5.0
SPP	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	5.3	5.0
TB	3.0	3.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	5.0
TP	3.0	3.0	5.0	4.0	5.0	5.0	5.0	2.0	5.3	6.0
TT	3.0	3.0	5.0	4.0	5.0	5.0	5.0	2.0	6.0	5.0
VDL	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0
VDR	5.0	3.0	4.0	5.0	5.0	5.0	5.0	7.0	6.7	7.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	5.0
BW	5.0	9.0	4.0	10.0	3.0	10.0	10.0	6.0	7.3	8.0
HDA	8.0	5.0	5.0	10.0	3.0	3.0	10.0	6.0	8.0	8.0
HDL	8.0	6.0	3.0	10.0	2.0	2.0	10.0	7.0	8.7	8.0
HDR	8.0	6.0	3.0	10.0	2.0	2.0	10.0	7.0	8.7	8.0
SBL	10.0	10.0	10.0	10.0	3.0	2.0	10.0	5.0	10.0	7.0
SPD	8.0	8.0	10.0	10.0	9.0	9.0	10.0	5.0	6.0	6.0
SPP	8.0	8.0	10.0	10.0	9.0	8.0	10.0	5.0	6.7	7.0
TB	5.0	9.0	10.0	10.0	9.0	9.0	10.0	6.0	10.0	5.0
TP	2.0	9.0	10.0	10.0	9.0	9.0	10.0	2.0	8.0	6.0
TT	10.0	10.0	10.0	10.0	9.0	9.0	10.0	2.0	10.0	5.0
VDL	8.0	6.0	5.0	10.0	2.0	2.0	10.0	6.0	8.0	8.0
VDR	8.0	6.0	5.0	10.0	2.0	2.0	10.0	6.0	8.0	8.0

TABLE 2. CONTINUED.

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	DNMIG	UPMIG	PRED	CCOST	OCOST
BG	2.0	2.0	10.0	1.0	10.0	10.0	1.0	5.0	4.0	4.0
BW	2.0	2.0	4.0	5.0	5.0	5.0	5.0	7.0	6.0	8.0
HDA	2.0	2.0	5.0	1.0	3.0	3.0	3.0	7.0	6.0	6.0
HDL	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
HDR	5.0	3.0	3.0	5.0	2.0	2.0	5.0	8.0	7.3	7.0
SBL	2.0	4.0	10.0	1.0	3.0	3.0	1.0	6.0	5.3	6.0
SPD	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	4.7	5.0
SPP	2.0	2.0	10.0	1.0	9.0	9.0	1.0	6.0	5.3	5.0
TB	3.0	3.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	5.0
TP	3.0	3.0	5.0	5.0	5.0	5.0	5.0	2.0	5.3	6.0
TT	3.0	3.0	5.0	4.0	5.0	5.0	5.0	2.0	6.0	5.0
VDL	5.0	3.0	4.0	5.0	4.0	4.0	5.0	7.0	6.7	7.0

TABLE 4. STRUCTURES RECOMMENDED FOR CONSIDERATION AT SPECIFIC SITES TO ENHANCE THE SURVIVAL OF SALMON SMOLTS MIGRATING PAST THE SITE.

SACRAMENTO RIVER SITES

SITE: STEAM

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BW	3.9	7.2	2.5	7.0	2.0	6.6	8.6	7.4	4.2
VDR	4.6	5.3	3.3	7.1	2.6	6.4	8.1	5.1	3.4
TB	5.4	6.9	4.4	5.6	3.4	5.6	8.3	5.4	3.3
TT	5.4	6.9	4.4	5.7	3.3	5.6	8.4	5.6	3.3
TP	4.9	6.6	4.4	5.4	3.1	5.4	8.3	5.7	3.3

SITE: CROSS

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BG	9.5	10.0	8.8	2.3	8.8	5.3	9.5	5.5	4.4
TP	5.8	8.2	7.7	5.8	4.0	3.8	8.1	5.7	3.1
HDA	4.6	7.6	4.9	3.2	3.3	5.7	8.4	5.4	3.0
TT	6.2	8.1	7.9	5.9	4.6	3.7	8.0	4.3	2.9
TB	6.2	8.1	7.9	5.9	4.7	3.7	7.9	4.0	2.9
SPP	4.8	6.5	10.0	3.2	6.8	2.5	7.1	4.8	2.6
SBL	5.0	7.1	10.0	3.2	4.0	3.0	7.9	4.6	2.3

SITE: THREE

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BG	4.0	6.5	2.9	4.3	2.8	8.5	8.8	7.3	4.7
HDL	4.5	6.0	2.7	4.2	2.7	8.3	8.9	5.7	4.0
VDR	5.5	5.3	4.1	3.5	3.0	8.3	8.7	6.5	4.0
VDL	4.5	6.0	3.4	4.2	3.3	7.5	8.8	5.7	4.0
HDA	3.8	5.5	5.7	1.8	3.7	7.8	8.1	4.8	3.2
TP	5.1	7.0	6.5	4.5	4.0	4.1	8.6	6.3	3.2
TB	5.6	7.3	6.5	4.6	4.3	4.3	8.6	5.0	3.0
TT	5.6	7.3	6.5	4.6	4.3	4.3	8.7	5.1	3.0

TABLE 4. CONTINUED

SAN JOAQUIN RIVER SITES

SITE: MIDD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BW	5.7	4.0	3.2	5.3	2.7	7.3	7.8	8.3	4.6
VDR	6.0	4.0	3.8	4.7	2.3	7.3	8.0	6.7	4.0
VDL	6.0	4.0	3.8	4.7	2.0	7.3	8.0	6.7	3.9
TB	6.2	6.5	4.8	6.3	2.8	5.0	8.1	6.3	3.3
TT	6.2	6.5	4.8	6.3	2.8	5.0	8.2	6.3	3.3
TP	5.7	6.2	4.8	6.0	2.3	4.8	8.1	6.7	3.2
HDA	3.3	3.3	6.7	1.3	3.0	5.3	7.1	5.7	2.6
BG	3.7	4.0	10.0	2.0	10.0	4.0	6.0	3.3	2.4

SITE: OLD

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BG	4.5	7.5	8.8	2.3	7.3	3.0	8.0	7.1	3.3
TT	5.9	8.4	6.6	4.6	3.7	4.3	8.4	6.2	3.2
TP	5.1	8.0	6.7	5.0	3.1	3.4	8.4	7.1	3.1
TB	6.0	7.6	6.6	4.5	3.9	4.0	8.2	5.0	3.0
HDA	3.5	6.9	5.5	1.1	2.4	4.9	8.2	6.0	2.5
SPP	4.9	5.9	10.0	0.9	6.8	1.7	7.8	4.2	2.2
SBL	4.9	6.7	10.0	0.9	4.2	2.0	8.3	5.0	2.0

SITE: SWP

TYPE	FEAS	BUILD	FLOW	NAV	EFF	UPMIG	CCOST	OCOST	Benefit-Cost Index
BG	9.7	6.7	10.0	8.3	7.3	9.0	9.1	4.7	5.5
TT	8.8	9.4	7.0	8.3	4.1	6.8	8.3	6.1	4.2
TB	7.9	8.9	6.6	7.9	3.7	6.3	8.2	6.0	3.9
TP	8.2	8.6	7.8	7.0	3.6	5.2	8.8	7.6	3.9
SBL	8.8	8.7	10.0	8.8	4.8	6.3	7.3	4.6	3.9
SPP	8.4	8.3	10.0	8.6	6.7	5.9	6.1	3.6	3.2