SUSITNA HYDROELECTRIC PROJECT

RESPONSE OF JUVENILE CHINOOK HABITAT TO MAINSTEM DISCHARGE IN THE TALKEETNA-TO-DEVIL CANYON SEGMENT OF THE SUSITNA RIVER, ALASKA

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PREFACE

The goal of the Alaska Power Authority in identifying environmentally acceptable flow regimes for the proposed Susitna Hydroelectric Project is the maintenance of existing fish resources and levels of production. This goal is consistent with mitigation goals of the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game. Maintenance of naturally occurring fish populations and habitats is the preferred goal in agency mitigation policies.

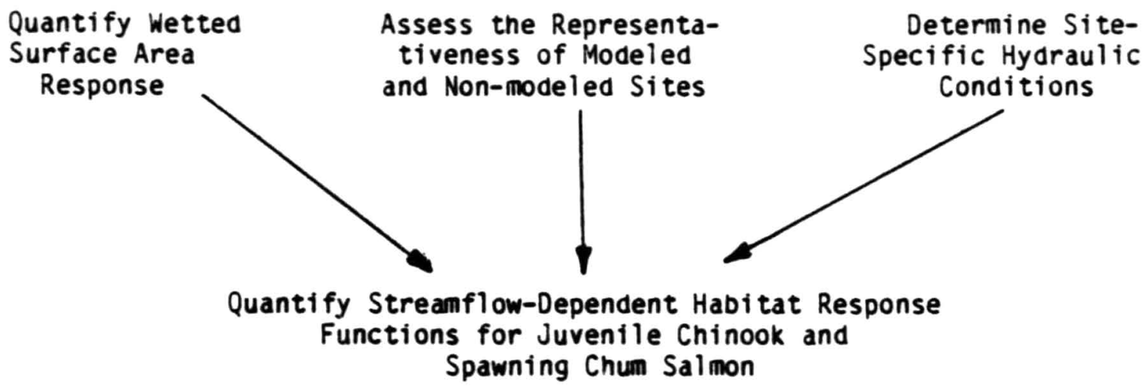
In 1982, following two years of baseline studies, a multi-disciplinary approach to quantify effects of the proposed Susitna Hydroelectric Project on existing fish habitats and to identify mitigation opportunities was initiated. The Insteam Flow Relationships Studies focus on the response of fish habitats in the middle Susitna River to incremental changes in main-stem discharge, temperature and water quality. As part of this multi-disciplinary effort, a technical report series was planned that would (1) describe the existing fish resources of the Susitna River and identify the seasonal habitat requirements of selected species, and (2) evaluate the effects of alternative project designs and operating scenarios on physical processes which most influence the seasonal availability of fish habitat.

The summary report for the IFRS, the Instream Flow Relationships Report (IFRR), (1) identifies the biologic significance of the physical processes evaluated in the technical report series, (2) integrates the findings of the technical report series, and (3) provides quantitative relationships and discussions regarding the influences of incremental changes in streamflow, stream temperature, and water quality on fish habitats in the middle Susitna River on a seasonal basis.

The IFRR consists of two volumes. Volume I uses project reports, data and professional judgment available before March 1985 to identify evaluation species, important life stages, and habitats. The report ranks a variety of physical habitat components with regard to their degree of influence on fish habitat at different times of the year. This ranking considers the biologic requirements of the evaluation species and life stage, as well as the physical characteristics of different habitat types, under both natural and anticipated with-project conditions. Volume II of the IFRR will address the third objective of the IFRR and provide quantitative relationships regarding the influences of incremental changes in streamflow, stream temperature, and water quality on fish habitats in the middle Susitna River on a seasonal basis.

The influence of incremental changes in streamflow on the availability and quality of fish habitat is the central theme of the IFRR Volume II analysis. Project-induced changes in stream temperature and water quality are used to condition or qualify the forecasted responses of fish habitat to instream hydraulics. The influence of streamflow on fish habitat will be evaluated at the microhabitat level and presented at the macrohabitat level in terms of a composite weighted usable area curve. This composite curve will describe the combined response of fish habitat at all sites within the same representative group to incremental changes in mainstem discharge.

Four technical reports are being prepared by E. Woody Trihey and Associates in support of the IFRR Volume II analysis. The function of each report is depicted in a flow diagram and described below.



RESPONSE OF AQUATIC HABITAT SURFACE AREAS TO MAINSTEM DISCHARGE IN THE TALKEETNA-TO-DEVIL CANYON SEGMENT OF THE SUSITNA RIVER, ALASKA

This report identifies five aquatic habitat types within the middle Susitna River directly influenced by changes in mainstem discharge and presents the necessary photography and surface area measurements to quantify the change in wetted surface area associated with incremental decreases in mainstem discharge between 23,000 and 5,100 cfs. The report also describes the influence of mainstem discharge on habitat transformations and tabulates the wetted surface area responses for 172 specific areas using the ten representative groups presented in the Habitat Characterization Report. Surface area measurements presented in this report provide a basis for extrapolating results from intensively studied modeling sites to the remainder of the middle Susitna River.

CHARACTERIZATION OF AQUATIC HABITATS IN THE TALKEETNA-TO-DEVIL CANYON SEGMENT OF THE SUSITNA RIVER, ALASKA

This report describes the characterization and classification of 172 specific areas into ten representative groups that are hydrologically, hydraulically and morphologically similar. Emphasis is placed on the transformation of specific areas from one habitat type to another in response to incremental decreases in mainstem discharge from 23,000 cfs to 5,100 cfs. Both modeled and non-modeled sites are classified and a structural habitat index is presented for each specific area based upon subjective evaluation of data obtained through field reconnaissance surveys. Representative groups and structural habitat indices presented in this report provide a basis for extrapolating habitat response functions developed at modeled sites to non-modeled areas within the remainder of the river.

HYDRAULIC RELATIONSHIPS AND MODEL CALIBRATION PROCEDURES AT 1984 STUDY SITES IN THE TALKEETNA-TO-DEVIL CANYON SEGMENT OF THE SUSITNA RIVER, ALASKA

This report describes the influence of site-specific hydraulic conditions on the availability of habitat for juvenile chinook and spawning chum salmon. Two aquatic habitat models are applied to quantify site-specific habitat responses to incremental changes in depth and velocity for both steady and spatially varied streamflow conditions. Summaries of site-specific stage-discharge and flow-discharge relationships are presented as well as a description of data reduction methods and model calibration procedures. Weighted usable area forecasts are provided for juvenile chinook at 8 side channel sites and for spawning chum salmon at 14 side channel and mainstem sites. These habitat response functions provide the basis for the instream flow assessment of the middle Susitna River.

RESPONSE OF JUVENILE CHINOOK AND SPAWNING CHUM SALMON HABITAT TO MAINSTEM DISCHARGE IN THE TALKEETNA-TO-DEVIL CANYON SEGMENT OF THE SUSITNA RIVER, ALASKA

This report integrates results from the surface area mapping, habitat characterization, and hydraulic modeling reports to provide streamflow dependent habitat response functions for juvenile chinook and spawning chum salmon. Wetted surface area and weighted usable area are the principal determinants of habitat indices provided in Part A of the report for juvenile chinook at each specific area and the ten representative groups identified in the habitat characterization report. Part B of this report provides habitat response functions for existing chum salmon spawning sites. The habitat response functions contained in this report will be used for an incremental assessment of the rearing and spawning potential of the entire middle Susitna River under a wide range of natural and with-project streamflows.

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1.0 INTRODUCTION

This report addresses the effects of flow variation on the availability and quality of juvenile chinook salmon habitat within the Talkeetna to Devil Canyon reach of the Susitna River. The response of juvenile chinook habitat to changes in streamflow within this middle reach of the Susitna River has been the subject of several years of data collection and modeling studies conducted by the Alaska Department of Fish and Game (ADF&G) and E. Woody Trihey and Associates (EWT&A). These investigations are part of an extensive environmental assessment program conducted to fulfill licensing requirements for the proposed Susitna Hydroelectric Project.

The Alaska Power Authority (APA), the state agency responsible for developing the hydropower potential of the Susitna River, has indicated a desire to maintain or enhance existing fish resources and levels of production within affected reaches of the river (APA 1983). This goal may be attainable through a variety of mitigative options (Moulton et al. 1984). However, to protect existing fisheries resources and to ensure the success of selected mitigation and enhancement efforts, it is necessary to identify and adopt instream flows and reservoir operation schedules which will provide for the needs of the fish species inhabiting the middle Susitna River.

The storage and release of water to meet the instream flow needs of fishes downstream is not necessarily deleterious to hydropower interests. The recharge and storage capabilities of the proposed Devil Canyon and Watana reservoirs [refer to APA (1983) for a description of the design criteria and construction schedule for these facilities] will permit water to be stored during periods when natural runoff exceeds both the water demand for power generation and the instream flow needs of resident and anadromous fishes. This will allow for the controlled release of water during periods of greatest need.

Peak demand for electricity typically occurs during the working day on a 24 hour cycle and during the winter on a seasonal basis. The frequency and rate of change of daily flow fluctuations in the middle reach may be of significant concern if the Watana dam alone is constructed and subsequently operated as a peak load following facility. However, if both dams are built, daily flow fluctuations are expected to be minimal, due to the anticipated regulating capability of the proposed Devil Canyon dam. Over the long term, however, use of the combined storage volume of the two reservoirs to satisfy peak seasonal power demand will result in lower summer and higher winter flows than presently occur. Figure 1 compares natural with simulated with-project mean weekly discharges for the middle Susitna River. Projected with-project flows are for 1) Watana reservoir operating alone assuming energy demand forecasts for 1996; and 2) both Watana and Devil Canyon reservoirs in operation, based on projected demand for 2020. These with-project flow scenarios correspond to Case E-VI, demand levels B and D, respectively (Harza-Ebasco Susitna Joint Venture 1985).

As the demand for electricity varies over time, so do the instream flow needs of a fish species vary according to their life history stage. Adult chinook spawn exclusively within tributaries of the middle reach of the Susitna River, principally Indian River and Portage Creek. Consequently,

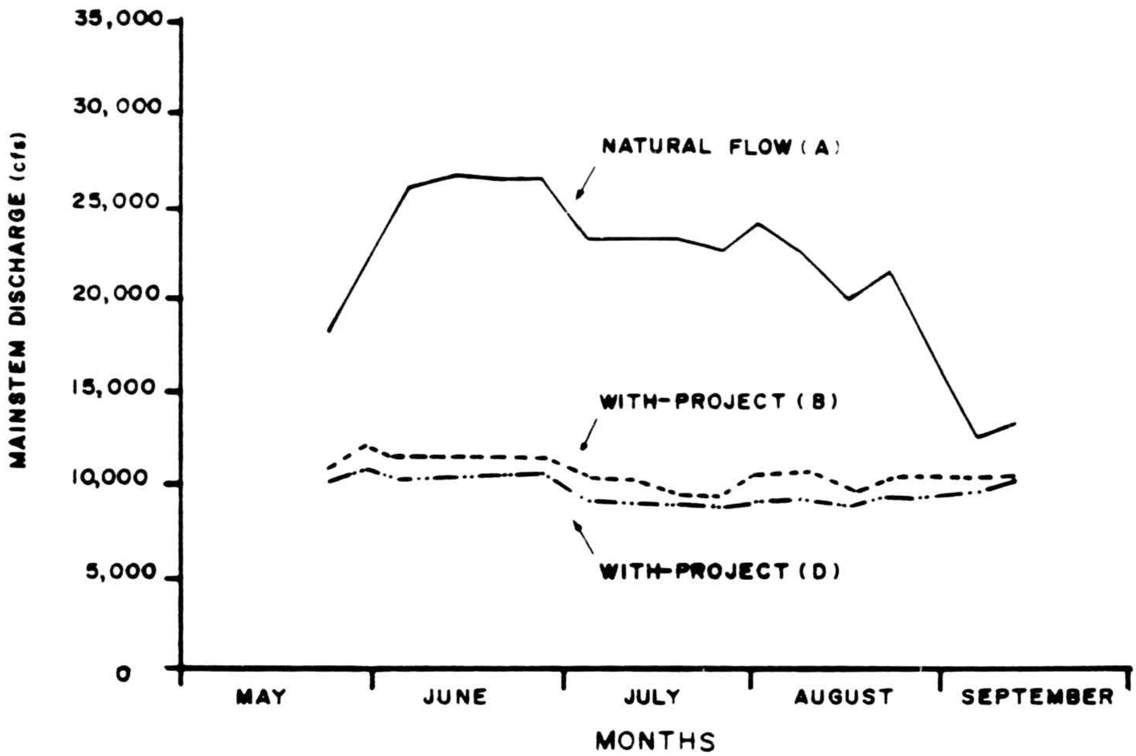

Figure 1. Natural and with-project mean weekly discharges for the middle Susitna River. Natural flows are based on 35 year record (1950-1984) from USGS Station 15292000 at Gold Creek. Simulated with-project flows are based on Case E-VI, demand levels B and D (data from Harza-Ebasco Susitna Joint Venture 1985).

the reproductive and early post-emergent fry life stages of chinook (unlike those of chum, pink and sockeye salmon which spawn in both tributary and non-tributary habitats of the middle Susitna River) are not likely to be affected by project operation. The later freshwater life stages of chinook salmon, including juvenile and migratory phases, will be subjected to altered streamflow regimes since they utilize mainstem and mainstem-influenced habitats. The summer growth season is a critical period for chinook juveniles since it is at this time that density-dependent factors typically have their greatest effect on the population. Due to the economic importance of the species, the ecological sensitivity of the life stage, and their extensive use of mainstem-associated habitats, chinook juveniles have been designated as a primary evaluation species to be used in analyses of existing and with-project conditions. Chum salmon spawning and incubation life stages comprise the other two primary species/life stages selected for evaluation (EWT&A and Woodward-Clyde Consultants [WCC] 1985).

Following emergence in March and April juvenile chinook typically spend several months rearing in their natal streams. However, the numbers and biomass of juvenile fish usually exceeds the carrying capacity of the tributaries by midsummer and a large fraction of the chinook population responds by emigrating to the Susitna River. During the remainder of their freshwater residency, which usually lasts until the spring of the following year, juvenile chinook occupy a wide range of habitats. Densities are highest in tributaries, side channels and side sloughs, respectively, during the open water season (Figure 2). Chinook distribution during the winter months is not well documented other than a noted tendency for individuals in mainstem and side channel areas to seek relatively warmer upwelling areas found in side sloughs. A significant number of young-of-the-year chinook apparently migrate downstream late in the summer, although it is uncertain whether they overwinter in fresh or saltwater (Dugan et al. 1984).

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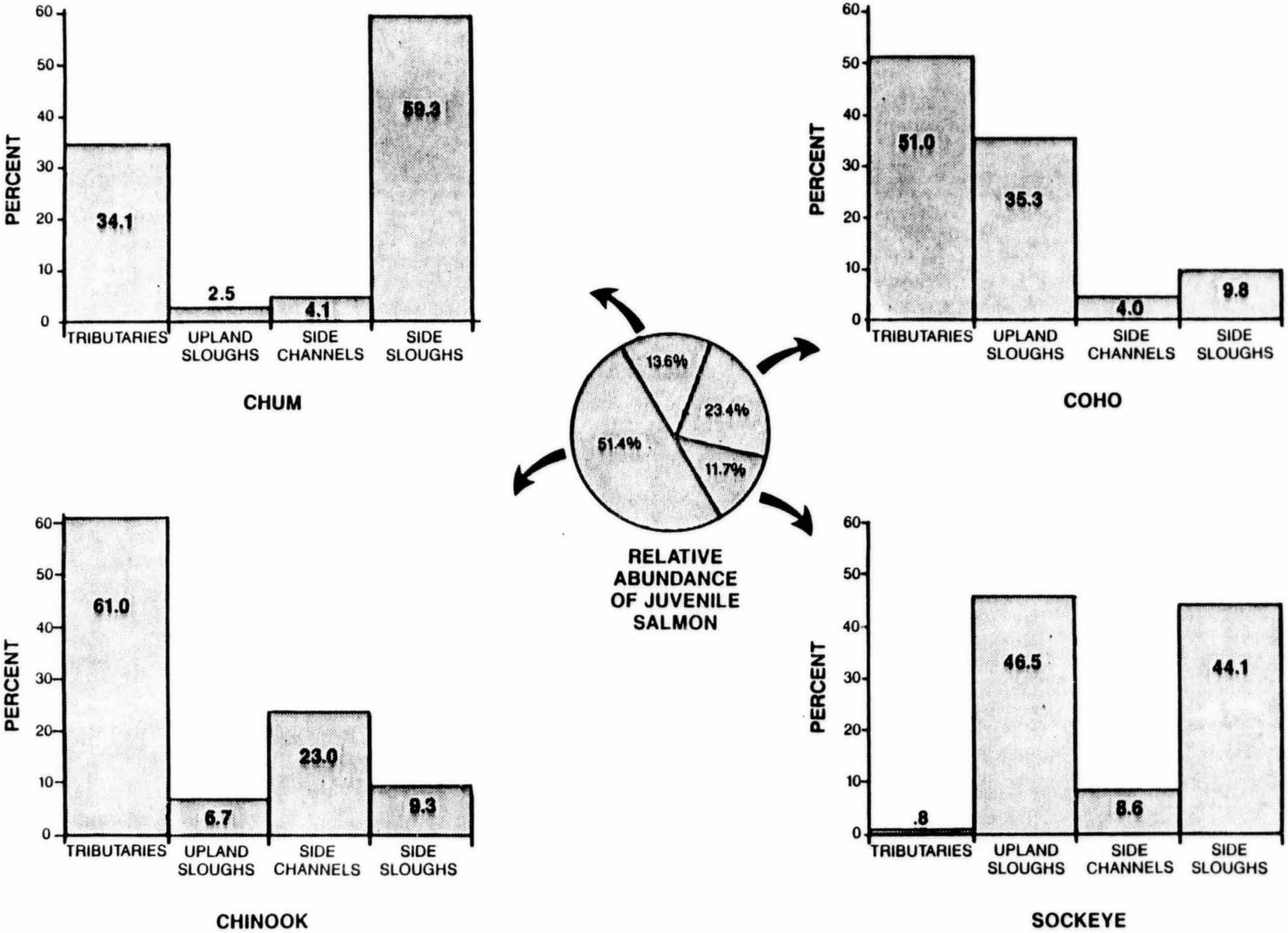


Figure 2. Percentage distribution of juvenile chinook salmon within different habitat types of the middle Susitna River during the open water period (from E. Woody Trihey and Associates and Woodward-Clyde Consultants 1985).

The biological and physical factors affecting juvenile chinook salmon in their rearing environment are complex. Milner (1985) critically reviewed these environmental factors and their effects. Food availability, predation, competition, and the incidence of disease and parasitism are among the more important biological factors. All are mediated to some degree by the quantity and quality of physical habitat which constitute the fish's living space. Physical habitat includes the combination of hydraulic, structural and chemical variables to which juvenile chinook respond either behaviorally or physiologically. Stream temperature, turbidity, suspended sediment level, water depth and velocity, cover, and substrate texture are important physical habitat variables which are either directly or indirectly influenced by the volume and pattern of streamflow.

The goal of minimizing potentially adverse effects of flow alterations associated with hydropower generation is possible only if the magnitude of the impacts is known, thereby presenting two major problems. The first relates to the quantification of existing resources and the relationships which sustain them. The second problem is methodological: how can predictions of with-project conditions be superimposed on natural conditions to enable accurate forecasts?

Existing and with-project conditions have not been sufficiently defined to offer straightforward solutions to these problems. For one, our knowledge of the population dynamics of chinook salmon stocks of the middle Susitna River yields little insight into their likely long-term response to with-project flow regimes. Population adjustments are frequently determined by combinations of environmental properties occuring far in advance of the biological response. Thus, although fish production and its component parameters (i.e., density, mortality, growth, etc.) may eventually reflect the influence of causative environmental factors, the complexity of these relationships is too great and there is too much variability in our estimates to base our forecasts entirely on population studies. We are not limited as much by our ability to conceptualize the relationships linking juvenile chinook to their environment as we are by our ability to measure and test these relationships.

This problem is not a new one. Fisheries biologists faced with the task of identifying acceptable instream flows often make their selection because it appears to make biological sense, and not on the basis of mathematically defined relationships between streamflow and biological response. In the past decade, however, an instream flow assessment methodology has been developed which partially bridges this gap. The Instream Flow Incremental Methodology (IFIM) described by Bovee (1982) provides a computer assisted capability of simulating important components of fish habitat based on site-specific field measurements. The suitability of fish habitat at a given flow is evaluated by reference to preference criteria. There are frequency distributions which describe the probability that a fish will be found in association with a particular level or interval of the habitat component in question. Once the spatial distribution and levels of habitat components are known or are reliably simulated for a range of flows, and the relationships between these components and behavioral preferences have been quantified, then a habitat response index may be calculated for each flow of interes.. Following standard IFIM terminology, this habitat response index is termed Weighted Usable Area (WUA). From an assumption that the carrying capacity of a stream varies with the amount of usable physical habitat, the direction and magnitude of WUA may be considered reliable indicators of the probable population response to discharge alterations. This assumption has been verified for some salmonid streams but not for others (Nelson 1980, Loar 1985). Factors other than the amount of usable habitat, such as inadequate food supplies and catastrophic events (e.g., floods), may have been responsible for the conflicting results.

For purposes of this report, the concept of habitat preference appears valid and the linkage between biological response and flow-related habitat changes, as indexed by WUA, is considered strong enough to make inferences concerning the present status and likely trends in juvenile chinook populations.

Included in this report are WUA functions and related habitat indices defining the relationship between mainstem discharge and chinook rearing habitat potential at 20 study (modeling) sites on the middle Susitna River. Modeling results are extrapolated from individual study sites to describe the response of juvenile chinook habitat within a number of different sub-environments of the middle Susitna River. Conventional methods of extrapolating WUA in single channel rivers based on the concept of continuous homogeneous subsegments represented by individual modeling sites are not applicable to large braided rivers like the the Susitna River due to large spatial variations in hydraulic and morphologic character. Aaserude et al. (1985) discuss this problem further. Consequently, investigators concentrated on sampling smaller areas of the middle river possessing relatively uniform yet comparatively distinct hydrologic, hydraulic and water clarity charcteristics. This sampling design prompted the development of an extrapolation methodology, first introduced by Steward and Trihey (1984), which weights WUA indices developed for each modeling site according to the proportion of the middle reach possessing similar hydrologic, hydraulic and water clarity attributes. This approach focuses on the characterization of fish habitat on the subenvironmental scale in order to overcome problems associated with the large degree of environmental variability in the middle Susitna River. Stratifying the river into subenvironments and identifying the relationship between streamflow and fish habitat at this level increases our confidence in the applicability of these results to the river as a whole.

Within the overall framework of the Susitna aquatic habitat assessment program, habitat modeling results obtained for individual subenvironments are particularly appropriate since related studies of juvenile fish distribution were conducted at this level (Hoffman 1985). An evaluation of habitat modeling results in combination with fish utilization data will permit an accurate assessment of rearing habitat response to natural and project-induced changes in streamflow for the entire middle river segment.

Figure 3 illustrates the primary steps in the extrapolation analysis. An outline of the data requirements and steps which comprise the methodology follows in order that the reader gain an appreciation of the utility of the rearing habitat response curves. The results of applying the full extrapolation analysis to existing flow regimes will be detailed in Volume II of the Instream Flow Relationships Report, scheduled for release by EWT&A in December 1985.

Quantification

Quantity surface areas of individual channel branches in the middle Susitna River for each flow for which aerial photography is available to determine the surface area response to mainstem discharge.

Stratification

Use available morphologic, hydraulic, and hydrologic information to stratify individual aquatic habitats into groups that are hydrologically and morphologically similar.

Simulation

Simulate the response of aquatic habitat quality to discharge with habitat modeling techniques at selected areas of the middle Susitna River.

Integration

For each evaluation species/life stage:

Integrate the quantification, stratification, and simulation components to determine the aquatic habitat response to discharge for the entire middle Susitna River.

Figure 3. Flow chart indicating steps followed in the extrapolation of site-specific juvenile chinook habitat indices to the entire middle Susitna River.

2.0 METHODS

2.1 Habitat Characterization of the Middle Susitna River

2.1.1 Study Site Classification

For the middle reach of the Susitna River, Klinger and Trihey (1984) identified six subenvironments, on the basis of water source and morphology, which they termed habitat types: mainstem, side channel, side slough, upland slough, tributary, and tributary mouth. Rearing habitat modeling sites were initially selected to conform with the concept of aquatic habitat types. The degree to which these habitat types are utilized by juvenile salmon as well as their susceptibility to project impacts determined the extent to which they were represented in modeling studies. Of the large number of locations sampled for juveniles in 1981 and 1982, significant numbers of chum, sockeye, and chinook salmon were found in tributary, side channel, side slough and upland slough locations. Chinook salmon utilization of these habitat types is summarized in Figure 2. Recognizing that rearing habitat in tributaries will probably not be affected by project operation, investigators excluded this habitat type from modeling studies. Juvenile salmon utilization of mainstem and tributary mouth areas was judged insufficient to warrant intensive study. The sites chosen for modeling studies of juvenile chinook habitat are identified by river mile and bank orientation (L and R denote left and right bank looking upstream) in Figure 4.

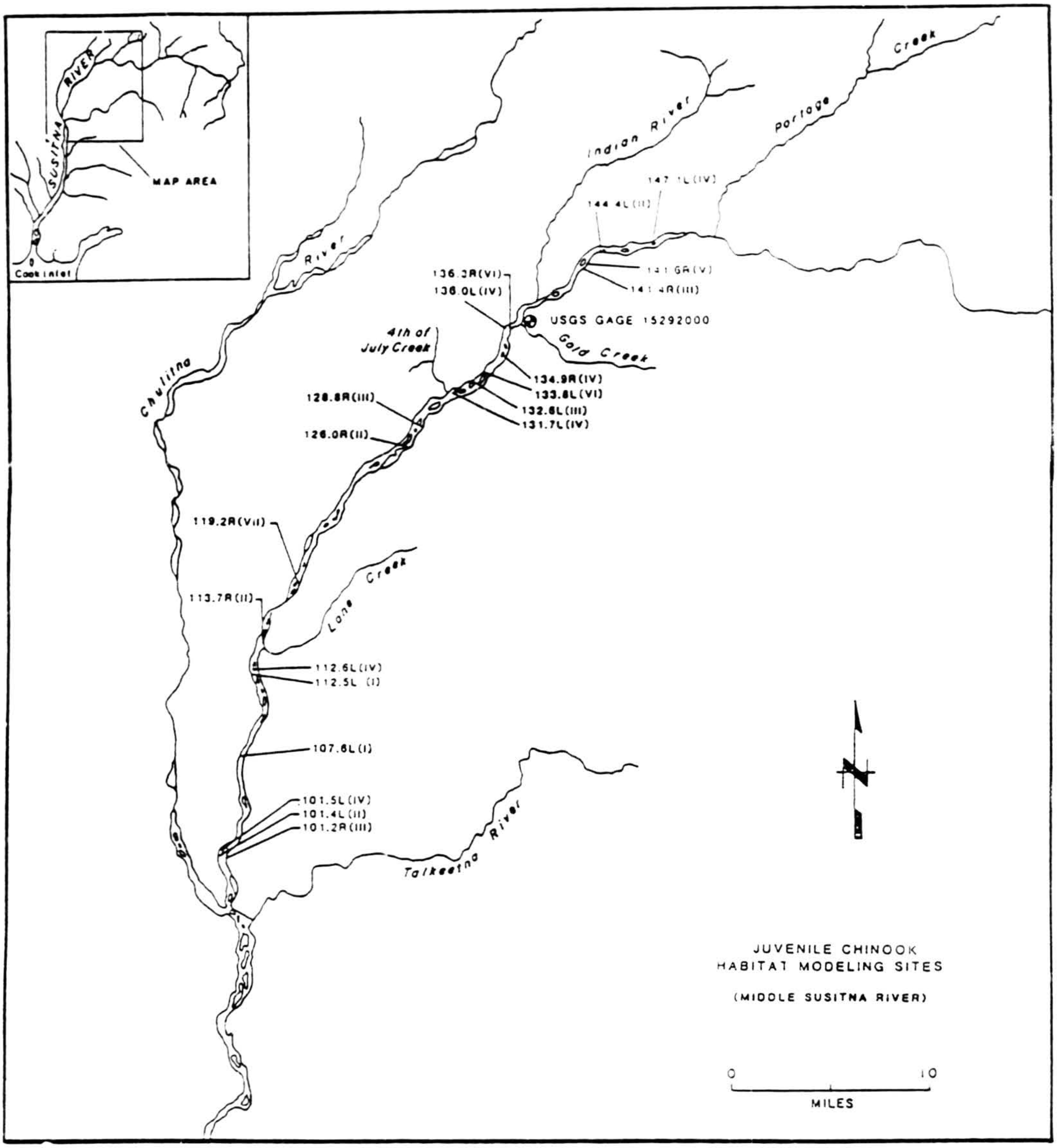


Figure 4. Juvenile chinook habitat modeling sites in the middle Susitna River. Sites are identified by river mile and bank orientation, where L and R denote left and right bank looking upstream.

2.1.2 Representative Groups

While the habitat type concept of Klinger and Trihey (1984) is useful in the identification of attributes characterizing a particular location within the middle river at a given time, the static quality implicit in the concept makes it less practical as a means of stratifying the river for extrapolation purposes. The results of the habitat modeling analyses are WUA forecasts for sites which frequently transform from one habitat type to another over the range of evaluation flows. Juvenile chinook habitat distribution and quality is highly dependent upon these transformations and the progressive physical changes which attend them.

In order that the dynamic and site-specific nature of rearing habitat response to a constantly changing aquatic environment be acknowledged by the extrapolation methodology, an alternate means of stratifying the middle river was developed. The concept of representative groups as a further set of distinct subenvironments of the middle river and the criteria used by Aaserude et al. (1985) to define them ensures that the modeling sites are truly representative of the portions of the river they are supposed to characterize. Accurate forecasts of the response of juvenile chinook to natural or imposed changes in flow regime require that this condition be satisfied.

Aaserude et al. (1985) delineated 172 specific areas of the middle river from aerial photography interpretation and field verification studies. Specific areas formerly assigned to four habitat types (side channel, side slough, upland slough, and in some cases mainstem habitats) were divided among ten representative groups, each characterized by unique and readily identifiable combinations of flow-related attributes. Representative groups and the primary hydrologic, hydraulic and morphologic forms and processes which distinguish them are summarized in Table 1.

Each modeling site is associated with a corresponding specific area; from an analysis of aerial photography and reconnaissance level field data, a modeled specific area may also be determined to be representative of several non-modeled specific areas within the same representative group. Within the framework of the extrapolation methodology, the collection of modeled and non-modeled specific areas which comprise a particular representative group may be thought of as a discontinuous (i.e., spatially discontinuous) yet homogeneous subsegment of the river.

Figure 4 indicates the representative group designation of each rearing habitat modeling site. Because the delineation of representative groups occurred subsequent to study site selection and data collection, some representative groups do not possess specific areas in which modeling studies were conducted. In particular, specific areas which dewater at relatively high mainstem discharges (Group VIII) and mainstem areas which remain shoal-like at most evaluation flows (Group X) are not represented by juvenile chinook habitat modeling sites. The remainder of the representative groups have at least one specific area with an associated modeling study site. This fact is important since the objective is to extrapolate habitat indices from specific areas with modeled sites to non-modeled specific areas, assuming that modeling sites generally reflect the habitat character of non-modeled areas within the same representative group. As will be discussed later, juvenile chinook habitat response within

Table 1. Primary hydrologic, hydraulic and morphologic characteristics of representative groups identified for the middle Susitna River.

REPRESENTATIVE GROUP	NUMBER OF SPECIFIC AREAS	DESCRIPTION	HABITAT MODELING SITES
I	19	Predominantly upland sloughs. The specific areas comprising this group are highly stable due to the persistence of non-breached conditions (i.e., possess high breaching flows). Specific area hydraulics are characterized by pooled clear water with velocities frequently near 0.0 fps and depths greater than 1.0 ft. Pools are commonly connected by short riffles where velocities are less than 1.0 fps and depths are less than 0.5 ft.	107.6L, 112.5L
II	28	This group includes specific areas commonly referred to as side sloughs. These sites are characterized by relatively high breaching flows (> 19,500 cfs), clear water caused by upwelling groundwater, and large channel length to width ratios (> 15:1).	113.7R, 126.0R, 144.4L
III	17	Intermediate breaching flows and relatively broad channel sections typify the specific areas within this Representative Group. These sites are side channels which transform into side sloughs at mainstem discharges ranging from 8,200 to 16,000 cfs. Lower breaching flows and smaller length to width ratios distinguish these sites from those in Group II. Upwelling groundwater is present.	101.2R, 128.8R, 132.6L, 141.4R
IV	23	Specific areas in this group are side channels that are breached at low discharges and possess intermediate mean reach velocities (2.0-5.0 fps) at a mainstem discharge of approximately 10,000 cfs.	101.5L, 112.6L, 131.7L, 134.9R, 136.0L
V	9	This group includes mainstem and side channel shoal areas which transform to clear water side sloughs as mainstem flows recede. Transformations generally occur at moderate to high breaching discharges.	141.6R
VI	14	This group is similar to the preceding one in that the habitat character of the specific areas is dominated by channel morphology. These sites are primarily overflow channels that parallel the adjacent mainstem, usually separated by a sparsely vegetated gravel bar. Upwelling groundwater may or may not be present. Habitat transformations within this group are variable both in type and timing of occurrence.	133.8L, 136.3R
VII	7	These specific areas are typically side channels which breach at variable yet fairly low mainstem discharges and exhibit a characteristic riffle/pool sequence. Pools are frequently large backwater areas near the mouth of the sites.	119.2R
VIII	22	The specific areas in this group tend to dewater at relatively high mainstem discharges. The direction of flow at the head of these channels tends to deviate sharply (>30 degrees) from the adjacent mainstem. Modeling sites from Groups II and III possessing representative post-breaching hydraulic characteristics are used to model these specific areas.	132.6L, 144.4L
IX	20	This group cosists of mainstem and side channels, including indistinct (i.e., shoal) areas, characterized by low breaching discharges. Specific areas tend to either retain their habitat type character or transform from indistinct to distinct channels. Mean reach velocities typically exceed 5 fps and up at moderately low discharges (10,000 cfs).	101.4L, 147.1L
X	13	Large mainstem shoals and the margins of mainstem channels which show signs of upwelling are included in this representative group.	None

Group XIII was represented using modeling results from study sites from Groups II and III. No attempt was made in the present analysis to characterize rearing habitat at specific areas included in Group X, However, future derivation of acceptable habitat response curves for this group is feasible through modification of direct input hydraulic/habitat models developed for spawning chum salmon (Hilliard et al. 1985)

Important criteria used to partition specific areas into representative groups are the type and rate of change in hydrologic character documented for the specific areas. The hydrologic component of the method used by Aaserude et al. (1985) to stratify the middle Susitna River focuses on the systematic transformation in habitat type of specific areas within the 5,100 to 23,000 cfs flow range. For example, as flows recede mainstem areas frequently become shallow water shoals, and side channels may transform into side sloughs; both habitat types may eventually dewater as flows decrease further. The emphasis on habitat transformation acknowledges the transient nature of riverine habitat availability and distribution. The dichotomous key in Figure 5 delineates the eleven habitat transformation categories derived from an evaluation of the 172 specific areas and eight streamflows for the middle river. Note that the final categories approximate the original "habitat type" designations used by Klinger and Trihey (1984) and ADF&G (1983). Two important modifications to the habitat type classification system are the inclusion of shoal habitat and the presence/absence of upwelling. Shoals are areas which at high flows are visually inseparable from adjacent mainstem or side channel areas. As flows recede the shoal or riffle character of these sites becomes obvious, even though the boundaries separating shoals and adjacent

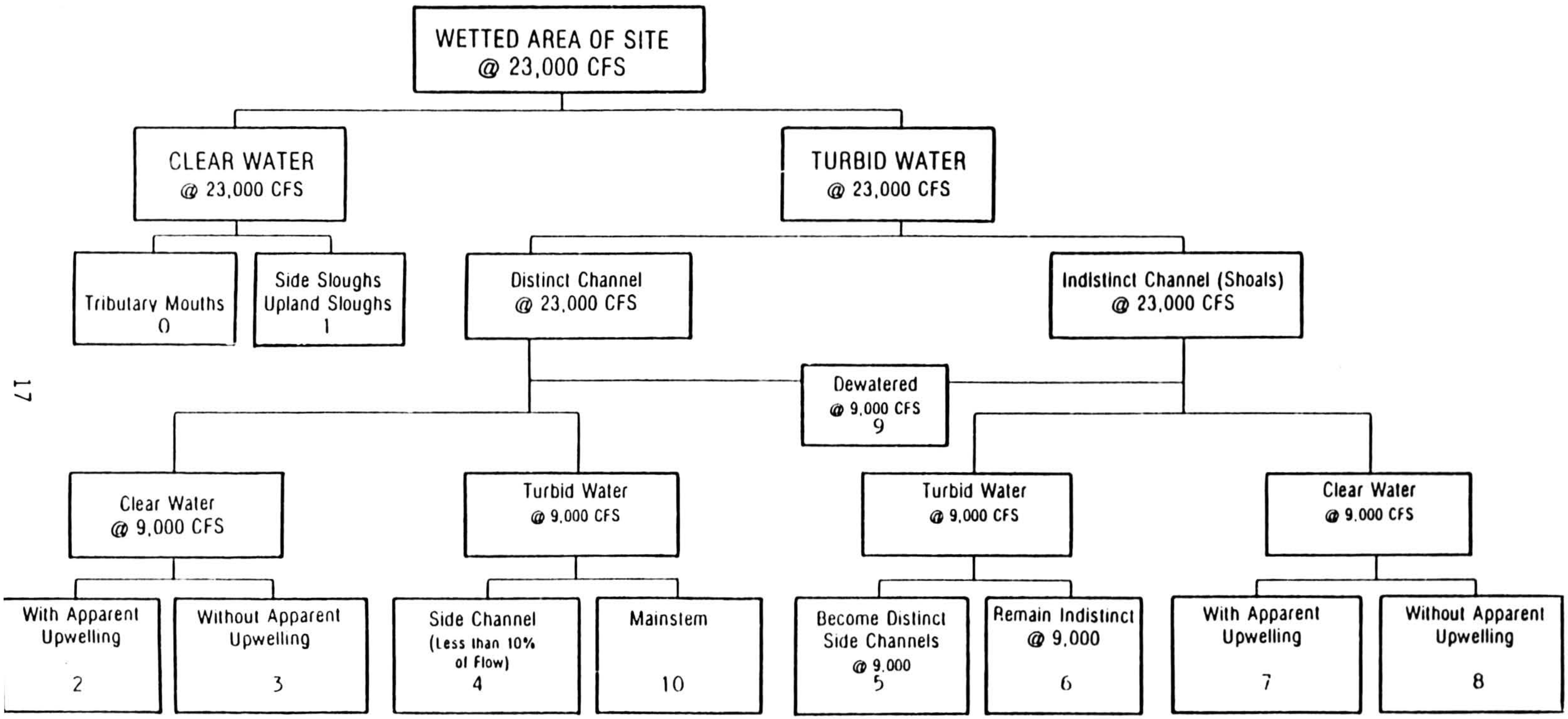


Figure 5. Key to habitat transformation categories used to classify specific areas to representative groups.

habitat types are usually indistinct. Specific areas fitting this description are further distinguished on the basis of whether their boundaries remain indistinct or transform into well-defined channels at lower flows. Upwelling groundwater, usually discernable in aerial photos by the presence of clear water, is accentuated in the classification step of the extrapolation methodology because of its pronounced effect on the distribution of juvenile and adult salmon within the middle Susitna River.

Using habitat types present at 23,000 cfs as a point of reference, site-specific habitat transformations have been defined for several discharges of 18,000 cfs and less. The sequential changes in habitat type observed within this flow range offers a powerful tool with which to combine specific areas into representative groups. Other hydrologic parameters used with varying degrees of confidence to cluster specific areas into representative groups are breaching flow, cross-sectional profiles of the head berm and adjacent mainstem channel, and upwelling.

Of the hydraulic variables examined by Aaserude et al. (1985), mean reach velocity under breached conditions was considered the most appropriate for classifying specific areas within the middle Susitna River. Unfortunately, the relatively low flows (8,000 - 11,000 cfs) at which field sampling was conducted precluded standardization of mean reach velocities on the basis of a common flow or transformational state. Mean reach velocities were unavailable at sampling flows for two-thirds of the specific areas delineated in the middle Susitna River; the majority of the sites were unbreached during reconnaissance field studies. Nonetheless, the velocity data collected was used to further refine transformation category definitions.

Of more practical value in the development of representative groups were channel morphology indices derived from aerial photo interpretation and on-site visits in the field. Specific areas within the middle reach exhibit sufficient similarities in plan form to provide a theoretically attractive means of grouping sites together. Use of channel geometry, sinuosity, length-to-width ratios and related morphologic indices to classify specific areas according to representative group is justified by the repetitiveness of similar channel features within the middle river segment.

2.2 Quantification of Surface Areas

Although each specific area is assigned to the same representative group for all flows of interest, the perimeter and therefore its surface area varies with discharge. Furthermore, both the absolute size and the rate of change in surface area varies between specific areas. Successful application of the extrapolation methodology requires that the surface area response to streamflow of individual sites be quantified since the amount of rearing habitat available within a specific area is dependent on its areal extent at different flows.

The total surface area of each specific area in the middle river has been estimated for mainstem discharges of 5,100, 7,400, 10,600, 12,500, 16,000, 18,000, 23,000 cfs using digital measurements on 1 inch = 1,000 feet scale aerial photography. The digitizing methods are described by Klinger and Trihey (1984). Surface area estimates were used to adjust WUA estimates at both modeled and non-modeled specific areas, as described in Section 2.4 below.

2.3 Physical Habitat Modeling Studies

2.3.1 Overview of Modeling Techniques

The quantitative assessment of juvenile chinook rearing habitat response to streamflow in the middle Susitna River is based on investigations conducted by ADF&G and EWT&A between 1982 and 1985. Sufficient data were collected to model chinook rearing habitat potential at 20 modeling sites typical of 9 of the 10 representative groups which characterize the middle Susitna River. These studies utilized two data intensive modeling techniques: 1) the Resident Juvenile Habitat (RJHAB) model developed by ADF&G; and 2) the Physical Habitat Simulation (PHABSIM) System developed by the Instream Flow and Aquatic Systems Group of the U.S. Fish and Wildlife Service. Data requirements and sampling methods employed by the two models are similar, and model parameters and standard output variables are identical (Figure 6). The major differences between RJHAB and PHABSIM modeling approaches relate to the resolution of input and output data and the techniques used to process these data. The RJHAB model generates surface area and WUA output only for those discharges for which hydraulic information was collected. The PHABSIM modeling system incorporates hydraulic models which may be used to forecast synthetic hydraulic data for any streamflow within an acceptable calibration range. These data serve as input to a program (HABTAT) which calculates wetted surface area and various habitat indices for the modeling site. WUA forecasts for unobserved flows based on the PHABSIM models are much more reliable than those obtained using the RJHAB modeling technique.

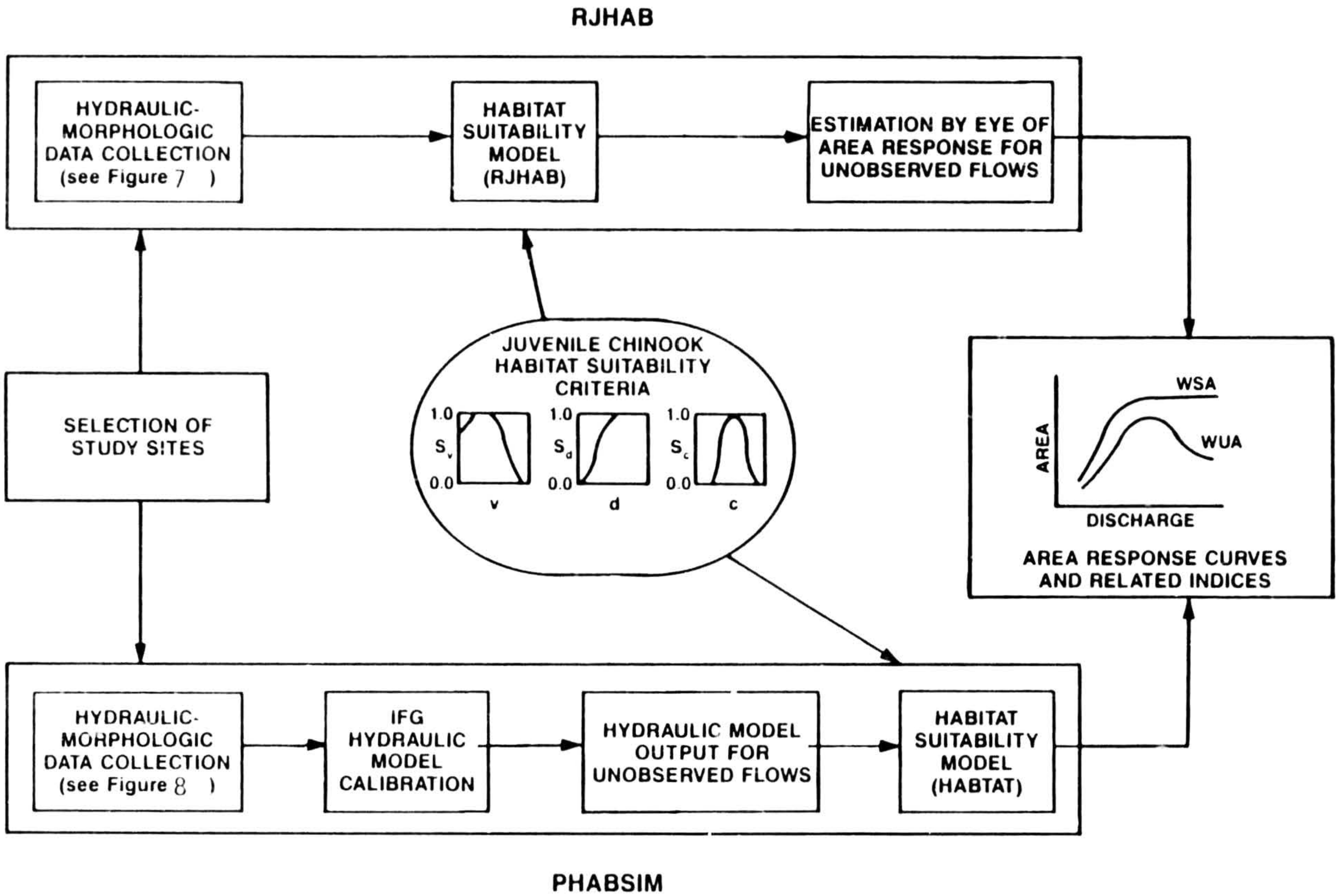


Figure 6. RJHAB and PHABSIM modeling pathways followed in the analysis of juvenile chinook salmon habitat.

Source documents for information relating to RJHAB and PHABSIM model development for middle river study sites include Estes and Vincent-Lang (1984), Hale et al. (1984), Marshall et al. (1984), and EWT&A and WCC (1985). Habitat suitability criteria serving as model parameters for HABTAT are described in Steward (1985).

2.3.2 Hydraulic Data Requirements

RJHAB and PHABSIM models applied in this study assess the influence of three key physical habitat variables known to significantly influence juvenile chinook salmon distribution, namely instream and overhead cover, water velocity and water depth. The availability of areas characterized by suitable combinations of these variables varies directly with changes in streamflow. The primary objectives of both habitat models are to quantify the distribution of various combinations of these habitat variables within a representative segment of stream and to describe this distribution in terms of its usability or potential as rearing habitat for juvenile chinook.

In order to describe rearing habitat potential based on the availability of suitable cover, velocity and depth within a study site, field measurements were obtained at discrete intervals along multiple transects. Figures 7 and 8 illustrate the basic differences between the RJHAB and PHABSIM sampling methods, including transect placement, number of verticals where hydraulic variables are sampled and the dimensions of the cells or mapping elements represented by these point measurements. In the case of the RJHAB modeling sites, cover and hydraulic data were collected at four to seven

$$d_i = \frac{\sum_{j=1}^{n} d_j}{n}$$

$$v_i = \frac{\sum_{j=1}^{n} v_j}{n}$$

where d_i = depth (ft) for i^{th} cell
d_j = depth (ft) at j^{th} vertical
d_n = depth (ft) at n^{th} vertical
v_i = velocity (ft/sec) for i^{th} cell
v_j = velocity (ft/sec) at j^{th} vertical
v_n = velocity (ft/sec) at n^{th} vertical
n = number of verticals

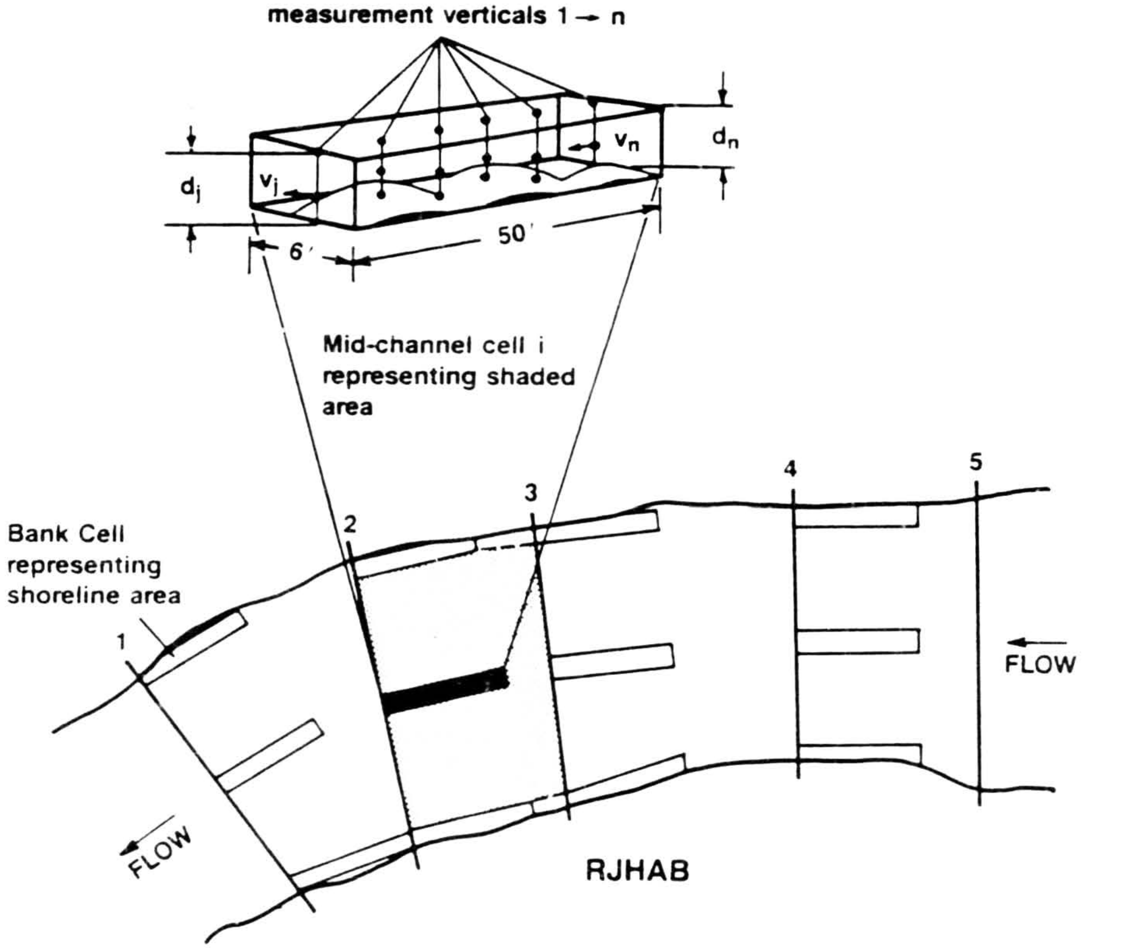


Figure 7. Sampling design for RJHAB modeling sites. The RJHAB model assumes that average values obtained for habitat variables within 6' x 50' bank and mid-channel cells are representative of larger areas within the modeling site.

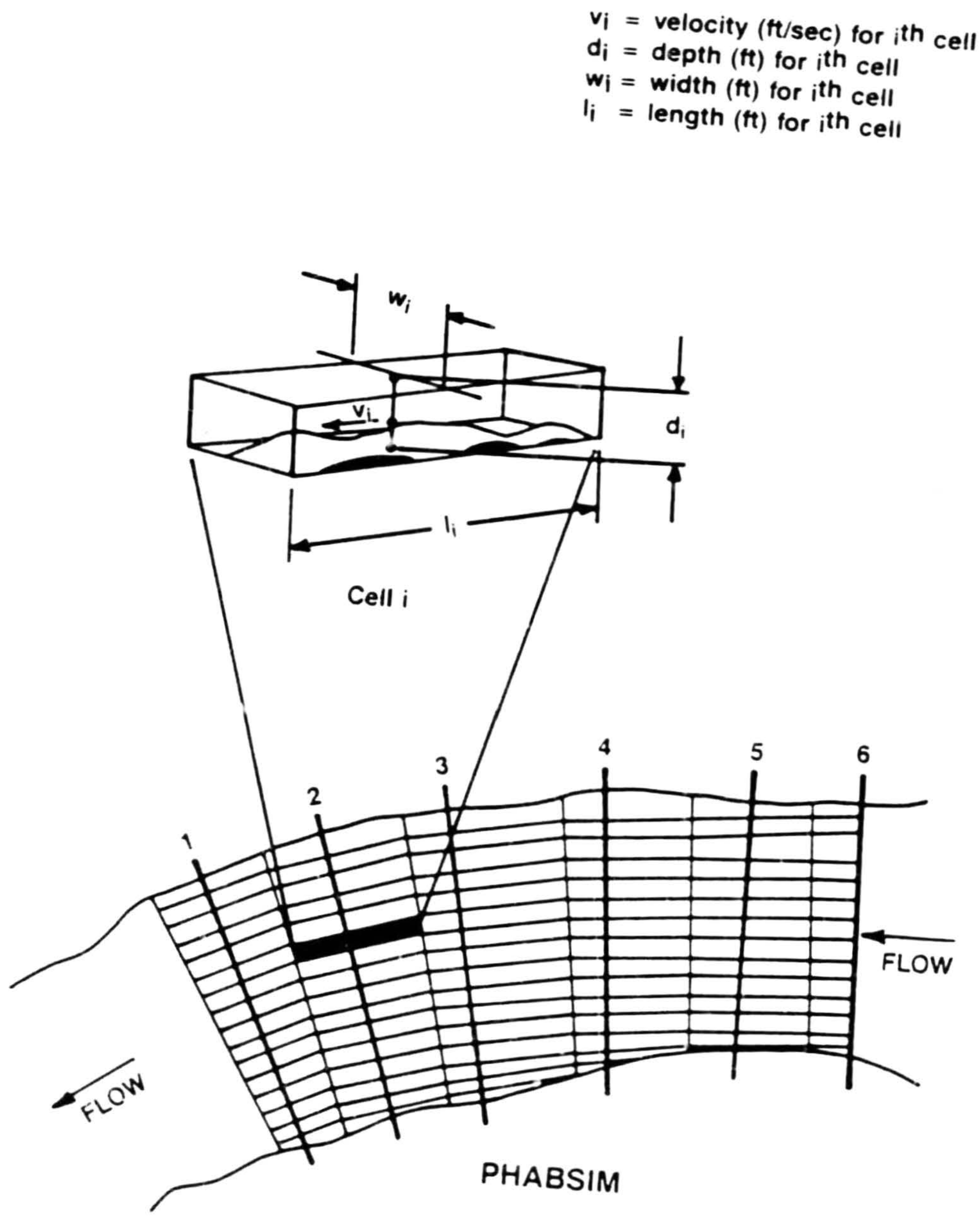


Figure 8. Sampling design for PHABSIM modeling sites.

different discharges. Two bank cells and one mid-channel cell, each 6 ft wide by 50 ft long, were sampled per transect. However, the areas represented as bank cells in surface area and WUA calculations extended 6 ft out from the left or right banks and upstream to the next transect. The mid-channel cells were considered representative of the area located between the 6 foot wide bank cells.

Cover, velocity and depth data for PHABSIM models were collected at several irregularly spaced verticals along the study site transects. The surface area associated with each cell extended halfway to adjacent verticals and transects (Figure 8). In contrast to the RJHAB model, the field data obtained in the PHABSIM analysis are used to calibrate a hydraulic model capable of forecasting depth-velocity combinations for each cell at unsampled discharges. Two types of hydraulic models were used for this purpose, depending primarily on hydraulic conditions at the study site. The IFG-2 model is a water surface profile type model based on the Manning equation and the principle of conservation of mass and energy (Milhous et al. 1984). Data requirements for the IFG-2 model include a single set of velocity data and several measurements of transect water surface elevations. Model calibration involves iterative adjustments of Manning's n values until agreement between observed and predicted water surface elevations is obtained. Once reliably calibrated, the IFG-2 model may be used to predict velocities within each cell across the transect at different discharges.

The second type of model used to simulate hydraulic data in rearing habitat investigations was the IFG-4, which employs linear regression analysis to predict depth and velocity as a function of discharge for each cell. The IFG-4 model requires a minimum of two hydraulic data sets but is better suited than the IFG-2 model for simulating rapidly varied flow conditions (Trihey and Baldrige 1985).

Estes and Vincent-Lang (1984), Hale et al. (1984), and Hilliard et al. (1985) provide further information on hydraulic data collection and analytical procedures.

2.3.3 Habitat Suitability Criteria

The next stage in the RJHAB and PHABSIM modeling process requires that habitat suitability criteria be developed for the species/life stages of interest. Habitat suitability criteria (curves) indicate the preference of a fish for different levels of a particular habitat variable; suitability curves are needed for each physical habitat variable incorporated in the habitat models. The cover, velocity and depth suitability criteria used in this study to evaluate chinook rearing habitat potential in the middle Susitna River are based primarily on field observations of juvenile chinook densities in side channel and side slough areas of the middle Susitna River (Suchanek et al. 1984). EWT&A and WCC (1985) and Steward (1985) discuss these data with regard to their applicability to mainstem, side channel and side slough habitats. The juvenile chinook suitability criteria recommended by Steward (1984) and summarized in Figures 9, 10, and 11 were applied in this study.

Of particular interest are the separate velocity and cover habitat suitability criteria which apply under clear and turbid water conditions.

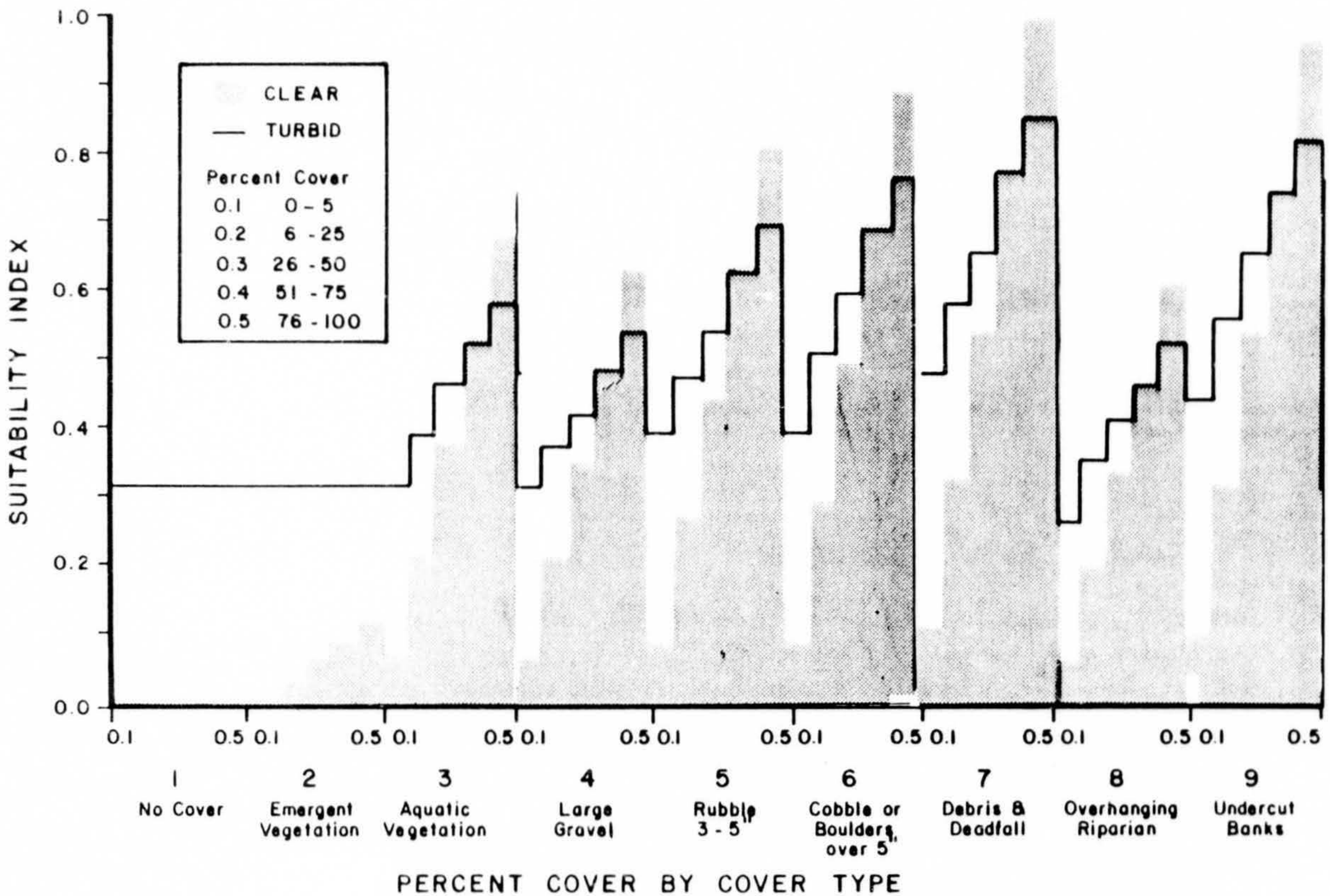


Figure 9. Cover suitability criteria used to model juvenile chinook habitat (WUA) in the middle Susitna River. Separate criteria are presented for clear and turbid water conditions (Steward 1985).

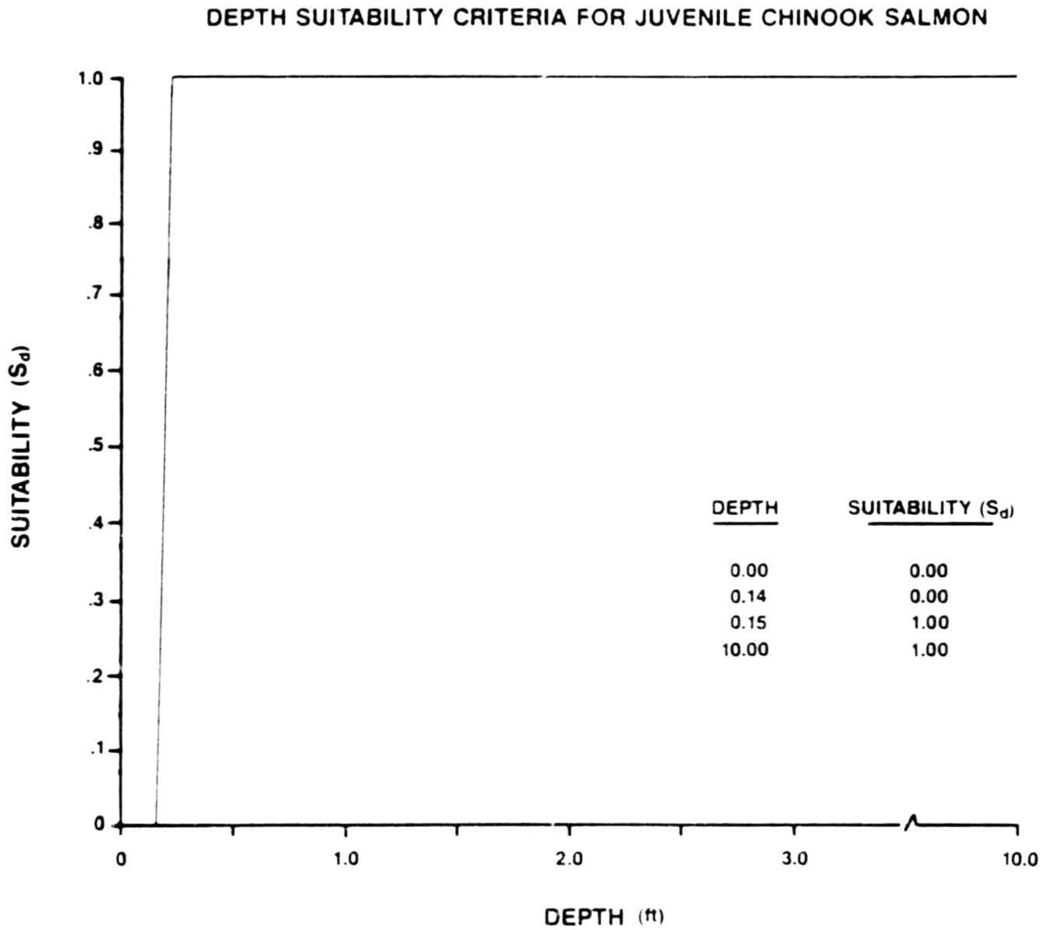
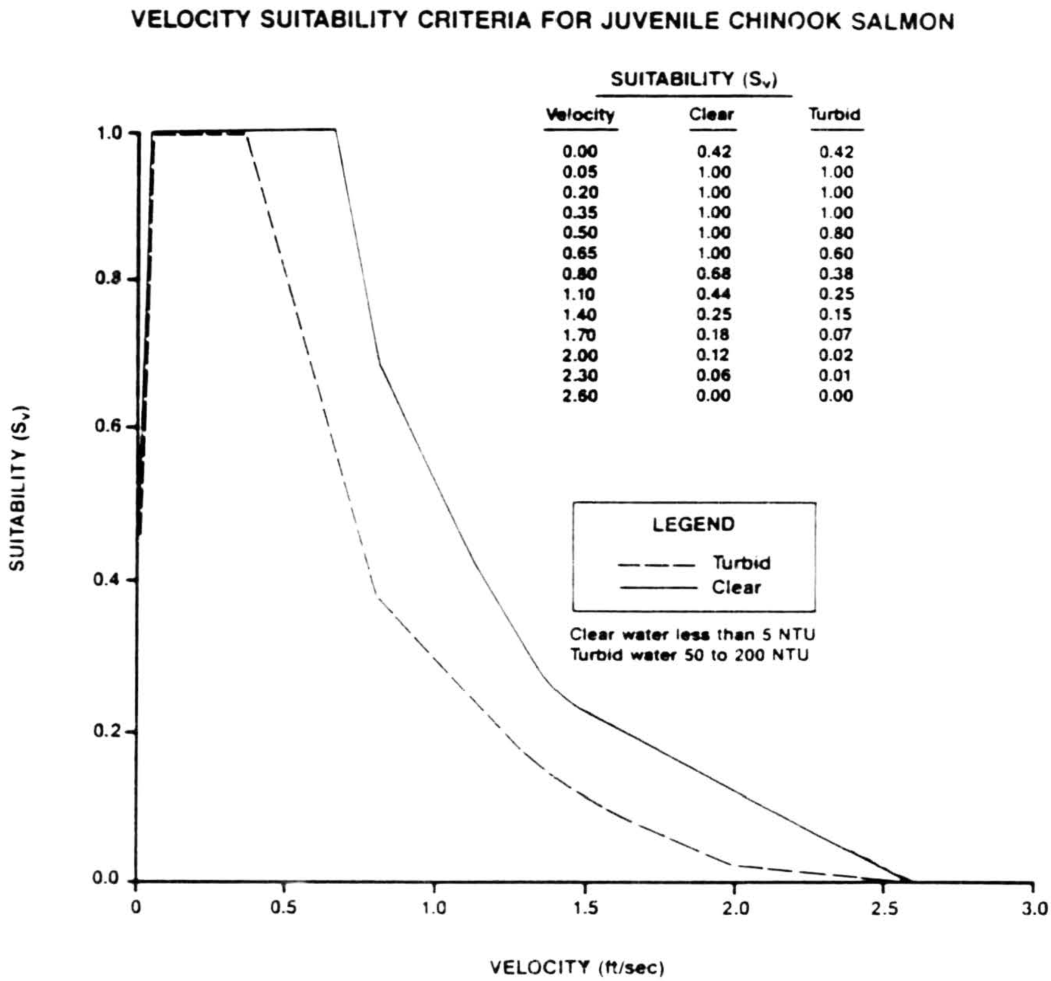


Figure 10. Depth suitability criteria used to model juvenile chinook habitat (WUA) under clear and turbid water conditions in the middle Susitna River (Steward 1985).



Velocity	Clear	Turbid
0.00	0.42	0.42
0.05	1.00	1.00
0.20	1.00	1.00
0.35	1.00	1.00
0.50	1.00	0.80
0.65	1.00	0.60
0.80	0.68	0.38
1.10	0.44	0.25
1.40	0.25	0.15
1.70	0.18	0.07
2.00	0.12	0.02
2.30	0.06	0.01
2.60	0.00	0.00

Figure 11. Velocity suitability criteria used to model juvenile chinook habitat (WUA) under clear and turbid water conditions in the middle Susitna River (Steward 1985).

Clear water habitats occur in side channel areas which are not breached by the turbid waters of the mainstem river yet maintain a base flow via groundwater upwelling or tributary inflow. The frequency and duration of this condition depends on the elevation of the thalweg at the head of the site relative to the water surface elevation of the adjacent mainstem. Site flow versus mainstem discharge relationships were used to determine when clear and turbid water velocity and cover criteria were to be applied.

Rearing salmon use cover to avoid predation and unfavorable water velocities. Instream objects such as submerged macrophytes, large substrates and organic debris, and overhanging vegetation in near shore areas can provide cover for juvenile chinook salmon. Instream object cover in most rearing areas of the middle Susitna River is provided by larger streambed materials, primarily rubble (3-5 inch diameter) and boulder (>5 inches) size substrates. The cover suitability criteria presented in Figure 9 and Table 2 suggest that juvenile chinook tend to associate with some form of object cover in both clear and turbid water habitats. Preference generally increases in proportion to the percentage of object cover present, particularly under clear water conditions. The different preferences for the same type and percent of object cover indicated by the clear and turbid water suitability criteria are due to the utilization of turbidity as cover by rearing chinook. Dugan et al. (1984) documented higher densities of chinook in breached, turbid water side channels than were found at the same sites under nonbreached, clear water conditions. This disparity was most pronounced at sampling sites possessing minimal object cover.

Table 2. Cover suitability criteria recommended for use in modeling juvenile chinook habitat under clear and turbid water conditions. Sources: Suchanek et al. 1984; Steward 1985.

Percent Cover	No Cover	Emergent Veg.	Aquatic Veg.	Large Gravel	Rubble 3"-5"	Cobble or Boulders <5"	Debris & Deadfall	Overhanging Riparian	Undercut Banks
				Clear Water (Suchanek et al. 1984))					
0-5%	0.01	0.01	0.07	0.07	0.09	0.09	0.11	0.06	0.10
6-25%	0.01	0.04	0.22	0.21	0.27	0.29	0.33	0.20	0.32
26-50%	0.01	0.07	0.39	0.35	0.45	0.49	0.56	0.34	0.54
51-75%	0.01	0.09	0.53	0.49	0.63	0.69	0.78	0.47	0.75
76-100%	0.01	0.12	0.68	0.63	0.81	0.89	1.00	0.61	0.97
				Turbid Water (EWT&A and WCC 1985)[1]					
0-5%	0.31	0.31	0.31	0.31	0.39	0.39	0.48	0.26	0.44
6-25%	0.31	0.31	0.39	0.37	0.47	0.51	0.58	0.35	0.56
26-50%	0.31	0.31	0.46	0.42	0.54	0.59	0.67	0.41	0.65
51-75%	0.31	0.31	0.52	0.48	0.62	0.68	0.77	0.46	0.74
76-100%	0.31	0.31	0.58	0.54	0.69	0.76	0.85	0.52	0.82

[1]Multiplication factors: 0-5% - 4.38; 6-25% - 1.75; 26-50% - 1.20; 51-75% - 0.98; 76-100% - 0.85

Water depth is not a significant factor limiting juvenile chinook habitat potential, as indicated by the open ended depth suitability curve in Figure 10. Provided that other microhabitat conditions are suitable, juveniles tend to prefer depths exceeding 0.15 feet to an equal degree. This observation has been corroborated in other habitat utilization studies of juvenile chinook salmon (Steward 1985).

A distinct preference by juveniles for low velocities under turbid water conditions was noted by Suchanek et al. (1984). Turbid water habitat suitability criteria identify optimal velocities in the 0.05 to 0.35 fps range, as compared to 0.5 to 0.65 fps indicated by clear water velocity criteria (Figure 11). The preference for lower velocities in areas of high turbidity may be twofold: 1) a lack of visual cues necessary to maintain position in faster currents, and 2) a decrease in the number of drifting prey items captured at higher velocities (Milner 1985).

2.3.4 Habitat Model Response Variables

The RJHAB model was modified slightly in order that the methods of calculating various indices of habitat potential, including WUA, and wetted surface areas were consistent for all modeling sites. Wetted surface area (WSA) estimates based on RJHAB and PHABSIM modeling approaches were computed by summing the surface areas of watered cells within the modeling site (Table 3). Flow related increases in wetted surface area at RJHAB sites were apportioned among mid-channel cells of the sites since the dimensions of the area represented by bank cells remained essentially unchanged for all flows. At study sites modeled with IFG-2 or IFG-4

Table 3. Wetted surface area (WSA), weighted usable area (WUA) and related habitat indices used in the evaluation of chinook rearing habitat potential within the middle Susitna River.

Statistic	Equation	Parameters/Units
Calculations Performed for Each Cell (i)		
Surface Area (A_i)	$A_i = w_i l_i$	w_i = cell width (ft) l_i = cell length (ft) (ft^2)
Composite Suitability (S_i)	$S_i = s(c_i)\ s(v_i)\ s(d_i)$	$s(c_i)$, $s(v_i)$ and $s(d_i)$ are weighting factors for cover, velocity and depth (dimensionless)
Weighted Usable Area (WUA_i)	$WUA_i = A_i\ S_i$	(ft^2)
Calculations Performed for a Modeling Site Comprised of (n) Cells		
Wetted Surface Area (WSA)	$WSA = \sum_{i=1}^{n} A_i$	includes all cells (ft^2)
Gross Habitat Area (GHA)	$GHA = \sum_{i=1}^{n} A_i$	includes cells with WUA > 0.0 (ft^2)
Weighted Usable Area (WUA)	$WUA = \sum_{i=1}^{n} A_i\ S_i$	(ft^2)
Habitat Availability Index (HAI)	HAI = WUA / WSA	(dimensionless)
Habitat Distribution Index (HDI)	HDI = GHA / WSA	(dimensionless)
Habitat Quality Index (HQI)	HQI = WUA / GHA	(dimensionless)

hydraulic models, the size and location of cells generally remained constant but the total number of cells increased or decreased as wetted top widths responsed to changes in flow. Hence, the cumulative surface area of the IFG modeling sites increased through the addition of new cells along the shoreline.

The composite suitability of each cell within the RJHAB and IFG modeling sites was determined by multiplying the individual suitability values associated with prevailing velocity, depth and cover conditions (Table 3). This method of calculation implies that the physical habitat variables evaluated by the models are assumed to be independent in their influence on habitat selection by juvenile chinook. Weighted usable area is computed for each cell by multiplying the cell's composite suitability by its surface area. The sum of the cell WUAs obtained for a given discharge yields the modeling site WUA; when plotted as a function of discharge, the modeling site WUA curve indicates the response of usable rearing habitat to changes in streamflow.

Habitat simulation results include WUA and WSA estimates for each study site for mainstem discharges ranging from 5,000 to 35,000 cfs as measured at the USGS Gold Creek gaging station. In order to facilitate comparisons between modeling sites, WSA is expressed in units of square feet per linear foot of stream. WSA is therefore proportional to the mean width of the modeling site. These units are less satisfactory for comparisons of WUA since usable habitat at a site is a function of surface area weighted by the suitability of its physical habitat attributes. An interpretation of habitat availability should not be made without reference to the total wetted surface area of the site. As an example, consider two study sites possessing relatively equal amounts of weighted usable area; the smaller site, particularly where there is a large disparity in size, possesses a greater amount of usable habitat relative to the prevailing wetted surface area. Therefore, a more meaningful index of habitat availability is the ratio of WUA to WSA, which is designated the Habitat Availability Index (HAI).

In the context of the extrapolation analysis, the Habitat Availability Index has the added merit of being unitless. Assuming that the HAI of a modeling site is representative of the associated specific area (i.e., both possess the same frequency distributions of cover, velocity and depth), the WUA of the specific area is equal to the product of the HAI and the total surface area of the specific area. Total surface areas are known, as discussed in Section 2.2, and therefore a flow-dependent habitat response curve may be derived for any specific area represented by a modeling site.

The HABTAT program of the PHABSIM modeling system and the RJHAB model were modified to compute the Gross Habitat Area (GHA) for each discharge of interest. The GHA is the cumulative (unweighted) surface area of cells possessing non-zero WUA values within a site. Gross Habitat Area is important because it represents the maximum area of rearing habitat available. Two other habitat response indices, the Habitat Distribution Index (HDI) and the Habitat Quality Index (HQI) are calculated by the following formulas:

$$HDI\ (\%) = GHA/WSA \times 100$$

and

$$HQI\ (\%) = WUA/GHA \times 100$$

The use of HDI and HQI indices partially overcomes a major criticism of most WUA-based interpretations of habitat potential, namely, that WUA is a quantification of the amount of suboptimal habitat within a study site expressed as an equivalent amount of optimal habitat. In other words, a cell with a surface area of 100 sq. ft. and a joint preference factor of 1.0, that is, optimal cover, velocity and depth conditions, is assumed to provide as much usable habitat as an area ten times its size which possesses a joint preference factor of 0.10. Although flow-related changes in the composite suitability of individual cells (i.e., at discrete locations within the modeling site) were not evaluated, we examined relationships between a modeling site's weighted usable area, gross habitat area and wetted surface area over a range of discharges to gain an understanding of probable changes in habitat quality within cells containing usable habitat.

Surface areas and habitat indices were simulated for site flows corresponding to mainstem flows ranging from 5,000 to 35,000 cfs at Gold Creek. Of the 20 study sites investigated, six were modeled using the RJHAB model and 15 were modeled using the PHABSIM modeling system. One study site, 132.6L (Representative Group III), was modeled using both RJHAB and PHABSIM techniques. In most instances, WSA, WUA and HAI values for unobserved site flows (in the case of RJHAB models) or flows lying outside the recommended extrapolation range of the hydraulic models (a frequently encountered situation in PHABSIM applications) were estimated by interpolation and trend analysis techniques (Hilliard et al. 1985). In fitting curves to data points forecast by the habitat models, reference was made to aerial photographs and site-specific channel geometry and breaching flow information.

2.4 Extrapolation of Modeling Results to Non-modeled Specific Areas

Whereas the general habitat characteristics of a modeling site may be assumed to be representative of the associated specific area, the same combination and quality of habitat attributes may not be found in other specific areas, even those classified in the same representative group. Aaserude et al. (1985) concluded that variations in structural characteristics, including several attributes known to affect the quality of juvenile chinook rearing habitat, are common among specific areas of the same representative group. These differences are significant enough that direct transfer of WUA functions from modeled to non-modeled specific areas is considered impracticable. For this reason, Structural Habitat Indices (SHIs) were developed from field data in order to rank specific areas within the same representative group according to their relative structural habitat quality. As indexed by SHI values, specific areas are evaluated on the basis of six variables: 1) dominant cover type, 2) percent cover, 3) dominant substrate size, 4) substrate embeddedness, 5) channel cross sectional geometry, and 6) riparian vegetation. These variables were weighted according to their relative importance to juvenile chinook salmon. For each variable, specific areas were placed in one of five descriptive categories, ranging from "non-existent" to "excellent" in quality. Each variable category received a corresponding numerical rating factor. A single SHI value was calculated for each specific area, including those containing modeling sites, by summing the products of variable weighting and rating factors. For further details concerning the collection and synthesis of data into structural habitat indices, see Aaserude et al. (1985).

In this, the integration step of the extrapolation methodology, Habitat Availability Indices (HAIs) derived for the modeling sites are used to estimate juvenile chinook WUA for each specific area of the middle Susitna River. As discussed above, the amount of usable rearing habitat at a specific area containing a modeling site may be calculated by multiplying the modeling site's HAI value (i.e., the WUA:WSA ratio obtained as model output) by the wetted surface area of the specific area. For each discharge, this calculation can be represented as

$$WUA_{sa} = HAI_{ms,sa} \times WSA_{sa}$$

where the subscripts ms and sa refer to the modeling site and the specific area within which it is found. As pointed out earlier, HAI values determined for the modeling site are assumed to be applicable to the entire specific area.

If it were reasonable to assume that the HAI response curves for all specific areas within a representative group were identical, then WUA values for non-modeled specific areas within the same group could be calculated by the above equation using a single HAI function. The structural habitat data of Aaserude et al. (1985), as well as the modeling results presented in this report do not support this assumption. Between-site variations in rearing habitat availability appear to result from dissimilarities in channel geometry (which are reflected by differences in breaching flows and the rate of change in WUA and WSA) and structural habitat quality (as indexed by SHI values). Therefore, each specific area of the middle Susitna River is assumed to possess a unique HAI curve which may nonetheless be patterned after the modeling site within the same representative group having the most similar hydrologic, hydraulic, and morphologic attributes. Specific areas within a representative group with more than one modeling site are divided between modeling sites on the basis of their SHI values. Thus, each modeling site may be considered representative of a subgroup of specific areas.

HAI curves are developed for non-modeled specific areas by modifying the HAI functions of associated modeling sites using information obtained in the classification and quantification steps of the extrapolation analysis, including: 1) breaching flows to normalize HAI functions on the discharge axis; and 2) structural habitat indices to adjust for differences in the quality of usable rearing habitat. Table 4 summarizes breaching flow and SHI information used in the development of HAI curves for non-modeled specific areas within Representative Groups I through IX.

The discharge at which the head berm of a specific area is breached is the dominant hydrologic variable affecting the availability of chinook rearing habitat. As will be demonstrated later, the vast majority of juvenile chinook HAI functions obtained for the middle Susitna River modeling sites exhibit a maxima just to the right of the breaching flow on the discharge (horizontal) axis. To develop an HAI response curve for a non-modeled specific area, the HAI curve obtained for the associated modeling site is shifted left or right on the abscissa depending on whether the breaching flow for the non-modeled specific area is lower or higher than that of the modeling site. The distance moved is equal to the difference in the sites' breaching discharges. This lateral shift, diagrammed in Figure 12, identifies the horizontal coordinates of the HAI curve for the non-modeled specific area. The lefthand curve in Figure 12 represents HAI values

Table 4. Mainstem breaching discharges and structural habitat indices (SHI) determined for specific areas within the middle Susitna River. Specific areas are arranged in representative groups by subgroup, where the modeled specific area representing each subgroup is located at top.

GROUP I

Specific Area	Breaching Flow (cfs)	SHI Ratio
107.6L	>35,000	1.00
119.4L	>35,000	1.02
120.0R	>35,000	1.14
113.1R	>35,000	1.02
129.4R	>35,000	1.00
135.5R	>35,000	1.23
135.6R	>35,000	1.02
139.0L	>35,000	0.73
112.5L	>35,000	1.00
102.2L	>35,000	1.22
105.2R	>35,000	1.01
108.3L	>35,000	1.03
121.9R	>35,000	1.06
123.3R	>35,000	0.99
127.2M	>35,000	0.85
133.9L	>35,000	0.99
134.0L	>35,000	1.31
136.9R	>35,000	1.01
139.9R	>35,000	1.09

GROUP II

Specific Area	Breaching Flow (cfs)	SHI Ratio
101.4L	22,000	1.00
115.6R	23,000	1.00
125.9R	26,000	1.04
137.8L	20,000	1.00
143.4L	30,000	1.02
113.7R	24,000	1.00
113.1R	26,000	0.61
118.0L	22,000	0.76
121.8R	22,000	0.53
122.4R	26,000	0.57
122.5R	20,000	1.00
123.6R	25,500	0.84
125.1R	20,000	0.94
131.8L	26,900	0.88
135.3L	23,000	0.59
137.5R	22,000	0.86
137.9L	21,000	0.98
140.2R	26,500	0.98
126.0R	33,000	1.00
133.9R	30,000	0.98
142.2R	32,000	1.02
144.4L	21,000	1.00
100.6R	33,000	1.00
101.8L	22,000	1.08
117.9L	22,000	1.03
126.3R	27,000	0.98
137.5L	29,000	1.02
142.1R	23,000	1.00

GROUP III

Specific Area	Breaching Flow (cfs)	SHI Ratio
101.2R	9,200	1.00
101.6L	14,000	1.00
110.4L	12,000	1.20
115.0R	12,000	0.98
119.3L	16,000	1.00
130.2L	8,200	1.07
130.2R	12,000	1.10
128.8R	16,000	1.00
100.6L	9,200	0.86
101.7L	9,600	0.94
133.7R	11,500	0.90
132.6L	10,500	1.00
100.4R	12,500	1.04
128.5R	10,400	0.98
128.7R	15,000	1.00
137.2R	10,400	1.00
141.4R	11,500	1.00

GROUP IV

Specific Area	Breaching Flow (cfs)	SHI Ratio
112.6L	<5,000	1.00
127.0L	<5,000	1.08
139.4L	<5,000	1.02
131.7L	<5,000	1.00
100.7R	<5,000	1.04
110.8M	<5,000	1.02
111.5R	<5,000	1.02
114.0R	<5,000	0.91
116.8R	<5,000	1.02
121.7R	<5,000	1.02
124.1L	<5,000	0.98
127.4L	<5,000	0.98
139.6L	<5,000	1.09
140.4R	<5,000	1.02
134.9R	<5,000	1.00
125.2R	<5,000	1.00
129.5R	<5,000	1.00
136.0L	<5,000	1.00
108.7L	<5,000	0.96
119.5L	<5,000	0.98
119.6L	<5,000	0.96
144.0R	<5,000	0.96
145.3R	<5,000	0.96

GROUP V

Specific Area	Breaching Flow (cfs)	SHI Ratio
141.6R	21,000	1.00
101.7L	10,000	0.86
117.0M	15,500	0.55
118.9L	<5,000	0.86
124.0M	23,000	0.91
132.8R	19,500	1.02
139.0L	<5,000	0.77
139.7R	22,000	0.91
143.0L	7,000	0.55

GROUP VI

Specific Area	Breaching Flow (cfs)	SHI Ratio
133.8L	17,500	1.00
117.8L	8,000	0.98
117.9R	7,300	1.00
119.7L	23,000	1.04
135.7R	27,500	0.65
138.8R	6,000	0.63
139.5R	8,900	0.63
136.3R	13,000	1.00
102.6L	6,500	1.28
106.3R	4,800	0.98
107.1L	9,600	1.28
138.0L	8,000	0.98
140.6R	12,000	1.13
142.0R	10,500	0.98

GROUP VII

Specific Area	Breaching Flow (cfs)	SHI Ratio
119.2R	10,000	1.00
114.1R	5,100	0.76
121.1L	7,400	1.05
123.0L	<5,000	0.95
125.6L	<5,000	1.27
127.5M	<5,000	0.76
131.3L	8,000	0.76

GROUP VIII

Specific Area	Breaching Flow (cfs)	SHI Ratio
132.6L	10,500	1.00
104.3M	21,000	0.98
109.5M	16,000	1.00
112.4L	22,000	0.55
117.2M	23,000	0.65
121.5R	19,500	0.65
123.2R	23,000	0.53
124.8R	19,500	0.94
125.5R	26,000	0.90
135.0R	23,000	0.90
135.1R	20,000	0.90
144.0M	22,000	0.63
145.6R	22,000	1.27
146.6L	26,500	0.98
144.4L	21,000	1.00
101.3M	9,200	0.95
102.0L	10,000	0.72
117.1M	15,500	0.53
118.6M	14,000	0.60
119.8L	15,500	0.85
120.0L	12,500	0.53
121.6R	15,500	1.00
128.4R	9,000	0.93
132.5L	14,500	0.95

GROUP IX

Specific Area	Breaching Flow (cfs)	SHI Ratio
101.5L	<5,000	1.00
104.0R	<5,000	1.07
109.4R	<5,000	1.00
111.0R	<5,000	0.78
117.7L	<5,000	0.91
131.2R	<5,000	1.07
135.0L	<5,000	1.07
147.1L	<5,000	1.00
105.7R	<5,000	0.93
108.9L	<5,000	0.93
113.8R	<5,000	0.93
127.1M	<5,000	0.93
128.3R	<5,000	1.11
129.3L	<5,000	1.09
129.8R	<5,000	0.98
139.2R	<5,000	1.07
141.2R	<5,000	1.21
141.3R	<5,000	1.21
142.8R	<5,000	0.98
144.2R	<5,000	0.93

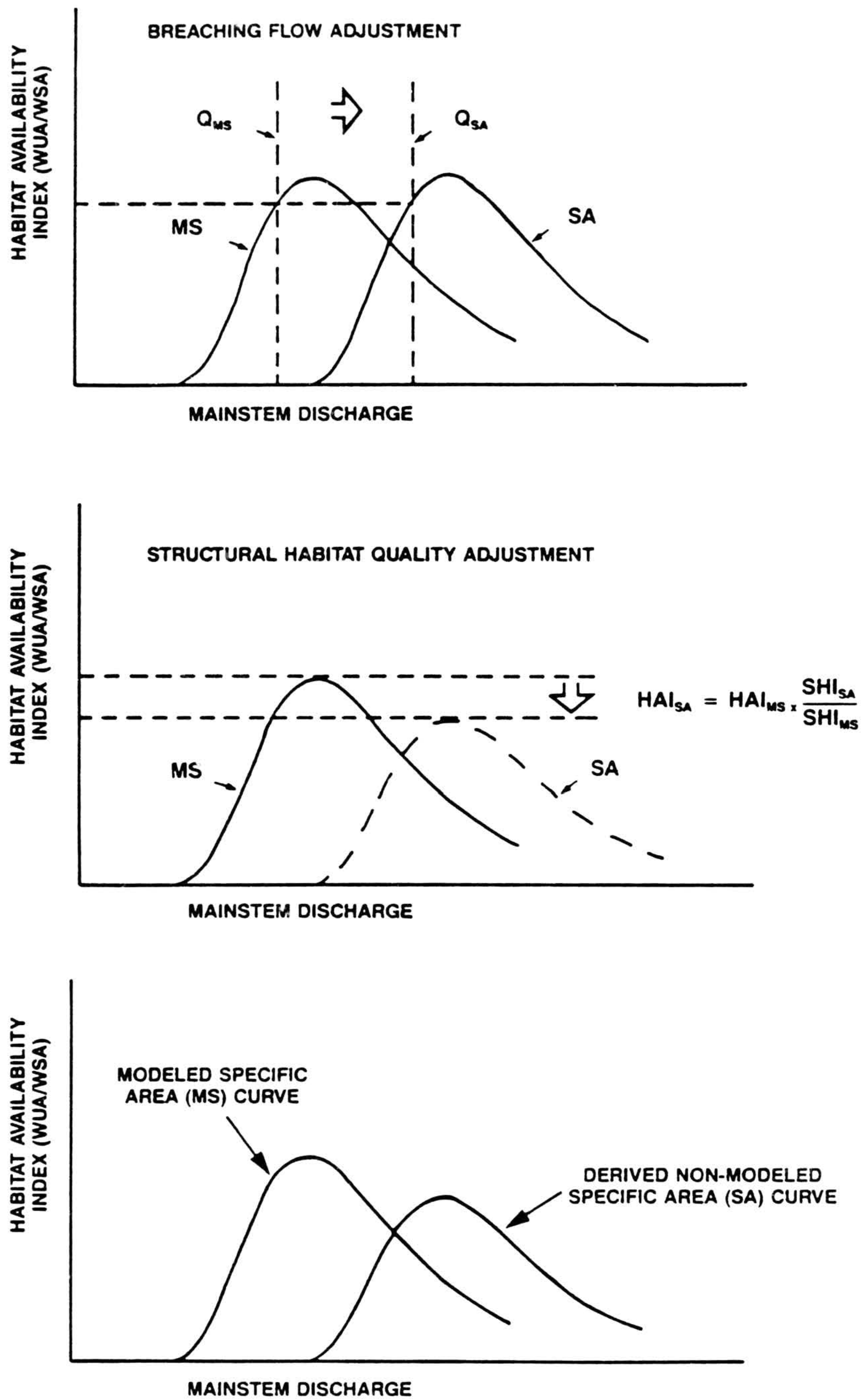


Figure 12. Derivation of a non-modeled specific area (sa) HAI curve using a modeled specific area (ms) HAI curve.
A. Lateral shift to account for differences in breaching discharge (Q_{ms} Q_{sa})
B. Vertical shift proportional to (SHI_{sa}/SHI_{ms}) to account for differences in structural habitat quality.
C. Final hypothetical modeled and non-modeled specific area curves.

forecast for a hypothetical modeling site. The curve on the right is an HAI function obtained for a related non-modeled specific area (also hypothetical) from the same representative group.

Structural habitat indices are used to determine the magnitude of the HAI response to flow at a non-modeled specific area (i.e., to "fix" the location of the HAI curve with respect to the vertical axis) as illustrated in Figure 12b. For each discharge, the following calculation is made:

$$HAI_{sa} = HAI_{ms} \times (SHI_{ms}/SHI_{sa})$$

In this case, the subscript ms refers to the modeling site whose HAI function has been adjusted using the breaching flow of the non-modeled specific area, identified by the subscript sa.

The non-modeled specific area in Figure 12c HAI curve has been shifted to the right and downward to account for the higher breaching flow and the lower structural habitat quality of the non-modeled site relative to the modeled site. An HAI response curve derived in this fashion may be multiplied by wetted surface area estimates to calculate WUA values for each flow of interest. Preliminary HAI functions have been developed for all middle Susitna River specific areas and appear in Section 4.0 of this draft report.

2.5 Application of Habitat Modeling Results

The synthesis of data obtained in the classification, quantification and simulation steps of the extrapolation analysis will provide estimates of chinook rearing habitat for 172 specific areas within the middle Susitna River. Preliminary surface area measurements have been obtained for specific areas in Representative Groups I through IX, and aggregate WUA curves for juvenile chinook salmon are presented herein for these subenvironments.

In regard to the rearing habitat potential of different representative groups, the relative significance of aggregate WUA functions in future decisions will likely be influenced by data concerning present and prospective utilization by juvenile chinook salmon under natural and with-project flow regimes. An assessment of the relative importance of the different representative groups in terms of their utilization by rearing chinook salmon will appear in Volume II of the Instream Flow Relationships Report. When coupled with information relating to food availability, water temperature, suspended sediment and other environmental factors, the aggregate physical habitat response functions will allow for conclusions and recommendations at the management level.

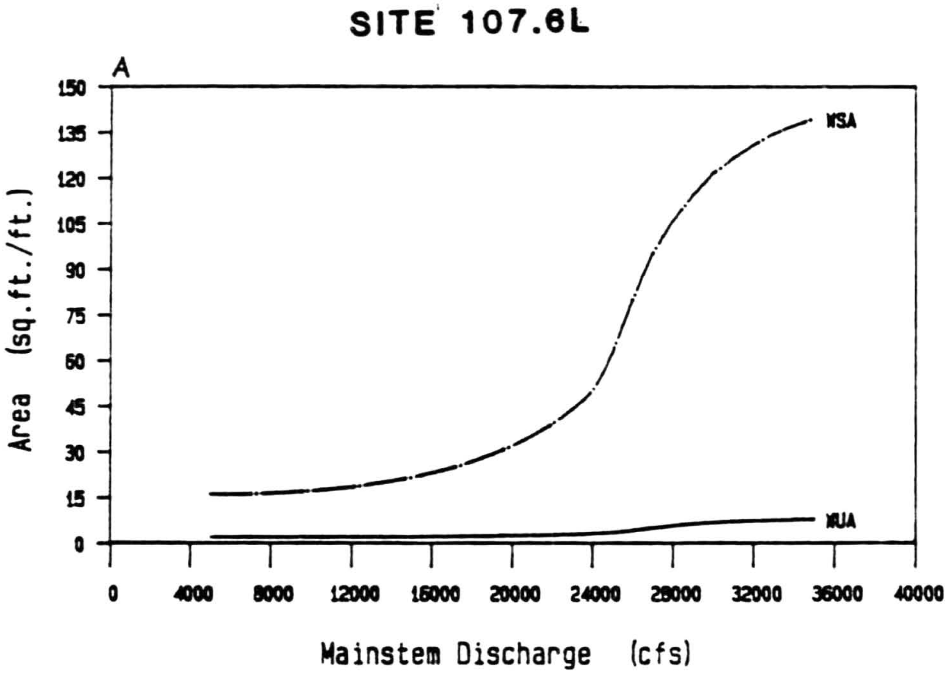
3.0 RESULTS

3.1 Representative Group I

The 19 specific areas within this group include all upland sloughs occuring in the middle Susitna River. Except during flood stage, these sloughs are connected to the main channel only at their downstream end. In addition to high breaching flows and low turbidity levels, typical features of specific areas in Representative Group I include low velocity pools of greater-than-average depth separated by short, higher velocity riffles. Clear water enters these sites via seepage or tributary inflow and maintains relatively stable base flows under non-breached conditions. Substrates are frequently homogeneous over large areas and are often characterized by fine silt/sand sediments overlaying cobble materials. Cover is usually provided by overhanging and emergent vegetation. These sites are used only to a small extent by juvenile chinook salmon (Marshall et al. 1984).

Specific areas assigned to Representative Group I are represented by two RJHAB modeling sites: 107.6L and 112.5L. Photographs of these sites when mainstem discharges were 23,000 and 16,000 cfs are presented in Plates A-1 and A-2 (Appendix A). For much of its length, Site 107.6L is a low gradient, narrow meandering stream. At mainstem discharges above 20,000 cfs, the turbid backwater area at the slough mouth advances upstream and inundates lower sections of the site; this phenomenon accounts for the marked relative increase in wetted surface area indicated in Figure 13.

Usable chinook rearing habitat at Site 107.6L does not respond dramatically to increases in wetted surface area, as evidenced by the WUA and HAI curves



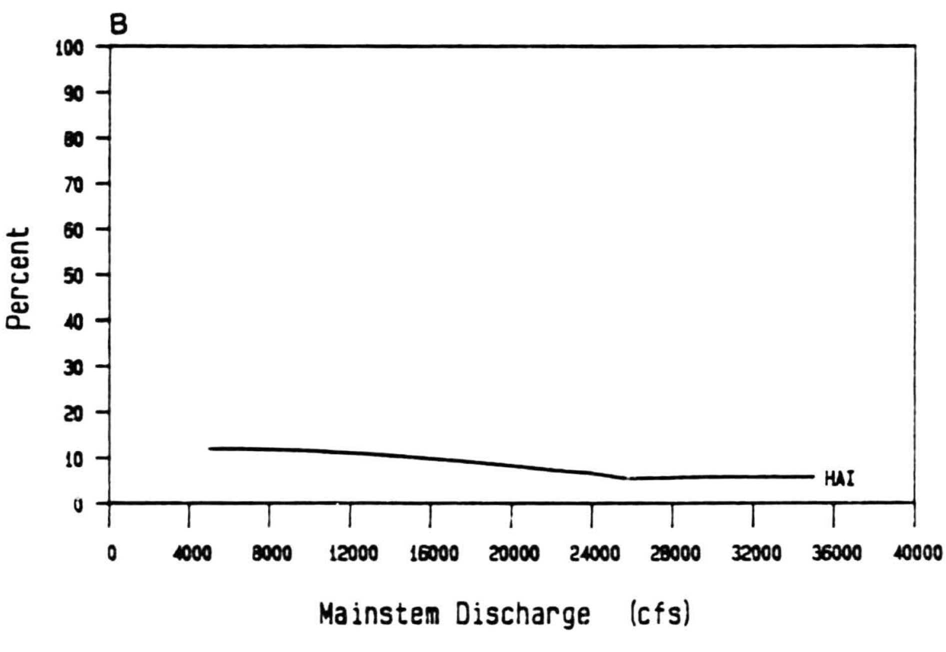


Figure 13. Surface area and chinook rearing habitat index response curves for modeling site 107.6L.
A- Wetted surface area (WSA) and weighted usable area (WUA).
B - Habitat availability index (HAI)

shown in Figure 13. WUA at this site gradually increases at higher flows due to the reduction in water velocity and water clarity caused by rising backwater. Water velocities ranging up to 0.8 fps are common at transects upstream of the backwater pool. Therefore, under clear water conditions nearly ideal velocities exist for juvenile chinook. A silt substrate is dominant, which affords little cover value for juvenile chinook, resulting in a low composite suitability for most cells within the site regardless of the suitability of their depths and velocities. As the extent of the backwater increases, velocities in these cells decrease to 0.0 fps, slightly reducing suitability with respect to this habitat variable, but turbidity levels increase, yielding a higher overall suitability (the weighting factor associated with the "no cover" class of cover using turbid water suitability criteria is 0.31, compared to 0.01 for clear water criteria). When coupled with an increase in surface area, this leads to the slight rise in WUA observed at higher flows. However, because the rate of change in WSA is so great relative to the change in WUA, the proportion of the site containing usable rearing habitat declines as flows increase. HAIs decrease from 11.9 percent at 5,000 cfs to 5.4 percent at 26,000 cfs.

In contrast to Site 107.6L, very little response in WSA, WUA, and HAI to changes in mainstem discharge were observed at Site 112.5L (Figure 14). The latter site is an upland slough with steep banks which prevents large changes in surface area as site water surface elevations change (Plate A-2). As a consequence, physical habitat conditions within this site remain relatively constant and little variation in WUA and HAI results from mainstem flow fluctuations below 35,000 cfs. Slight inconsistencies in ADF&G field data required that an average HAI value (4.2 percent) be used to back

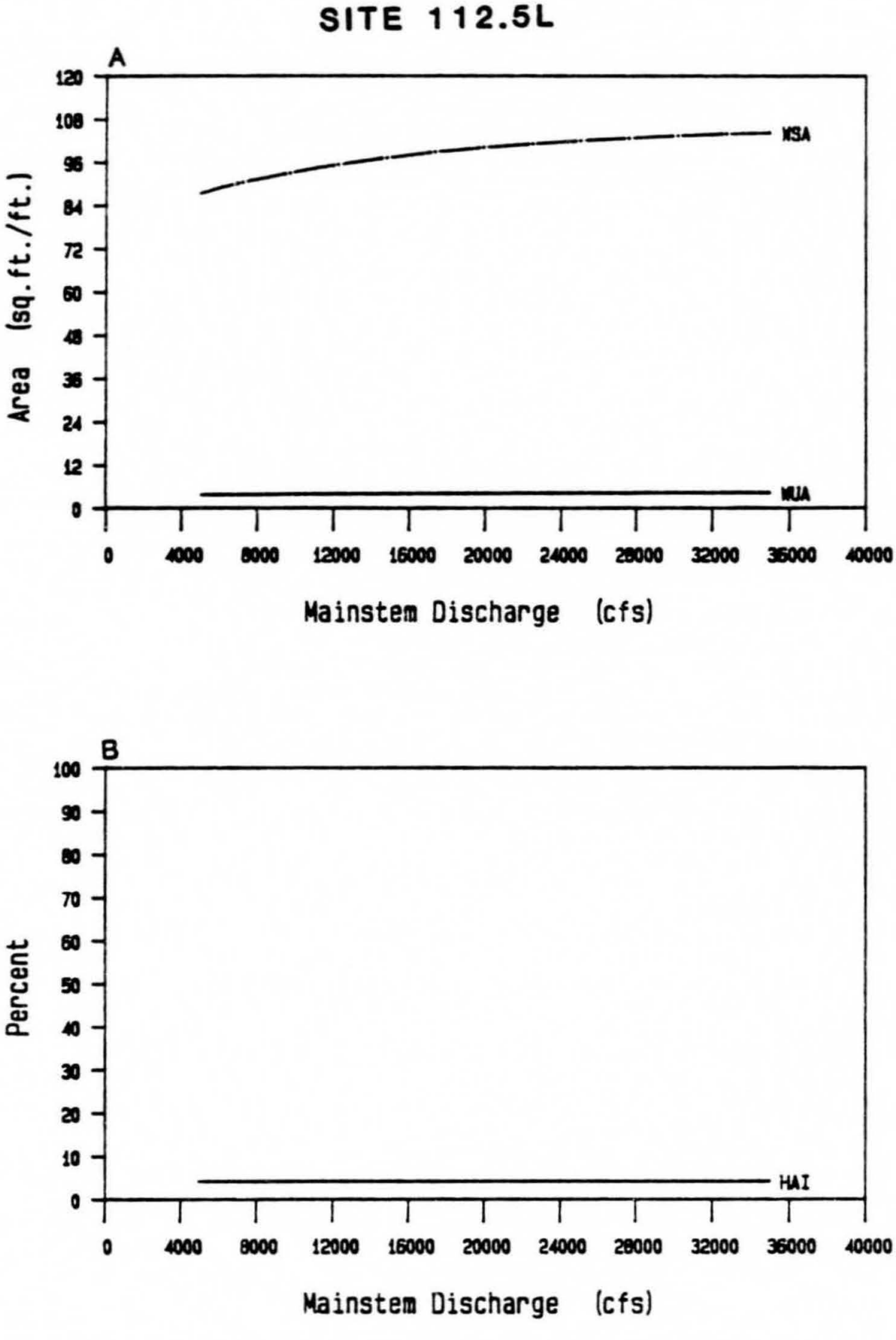


Figure 14. Surface area and chinook rearing habitat index response curves for modeling site 112.5L.
A- Wetted surface area (WSA) and weighted usable area (WUA).
B - Habitat availability index (HAI)

calculate WUA values for Site 112.5L. Values derived for these habitat indices were comparable to those recorded for Site 107.6L.

Specific areas assigned to Representative Group I are former side channels and side sloughs that have become increasingly isolated over time from the mainstem owing to long-term channel activity. Due to the infrequency of breaching events, the primary response in habitat character at these sites results from backwater effects at the upland slough/mainstem interface. Differences between specific areas are related primarily to the extent of backwater areas, and secondarily to the presence or absence of riparian and instream vegetation. Variations in local runoff resulting from precipitation may also affect short-term habitat availability and quality.

Of the two modeling sites investigated, Site 107.6L is located within a specific area which is representative of 8 of the 19 specific areas classified in Group I, based on between-site comparisons of Structural Habitat Indices (SHIs) obtained from Aaserude et al. (1985). Site 112.5L may be considered representative of the remaining specific areas, each possessing an SHI of 0.56 or greater. HAI functions were derived for modeled and non-modeled specific areas associated with each of the modeling sites and are presented in Figures 15 and 16 (see also Appendix B). These HAI curves were not adjusted laterally on the discharge axis since the specific areas within Representative Group I are breached at extremely high mainstem discharges. Differences in habitat availability between specific areas are assumed to be due to dissimilarities in structural habitat quality.

For each specific area included in Representative Group I, HAI ratios representing the amount of usable rearing habitat per unit surface area at

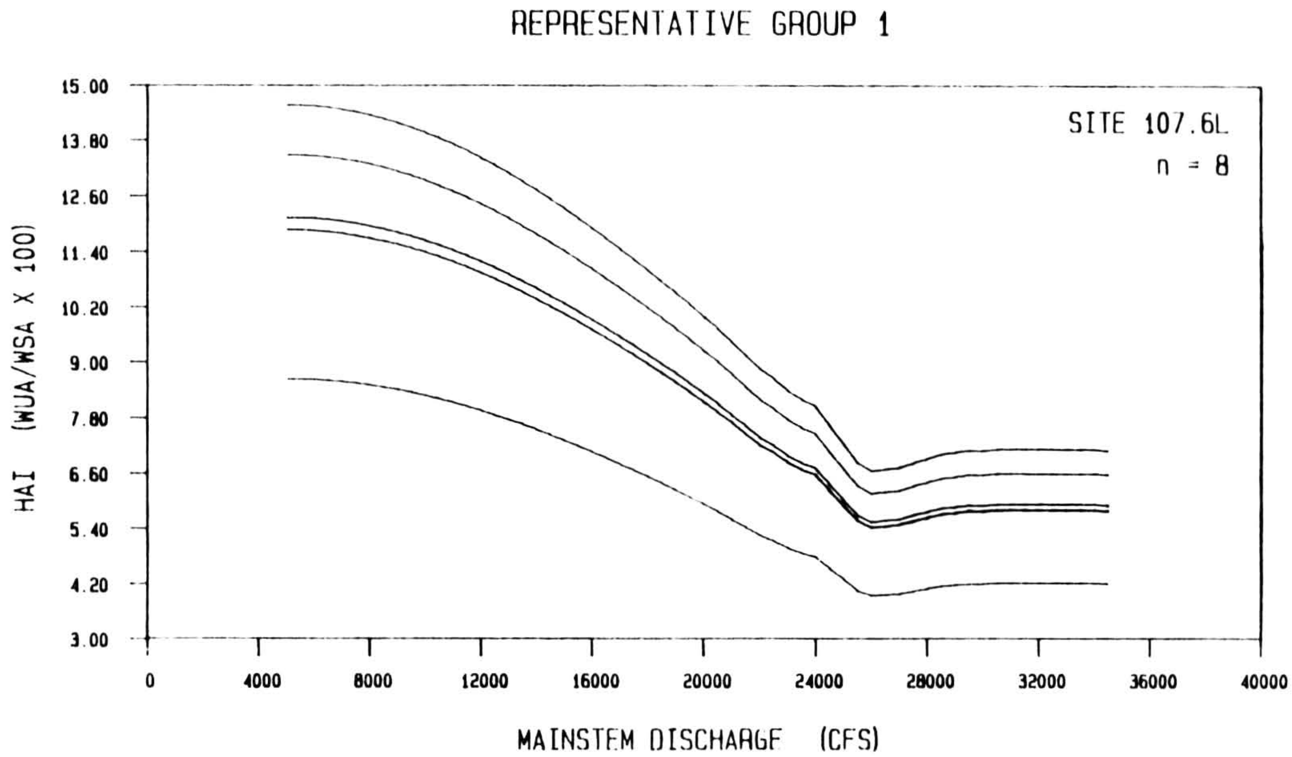


Figure 15. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 107.6L of Representative Group I.

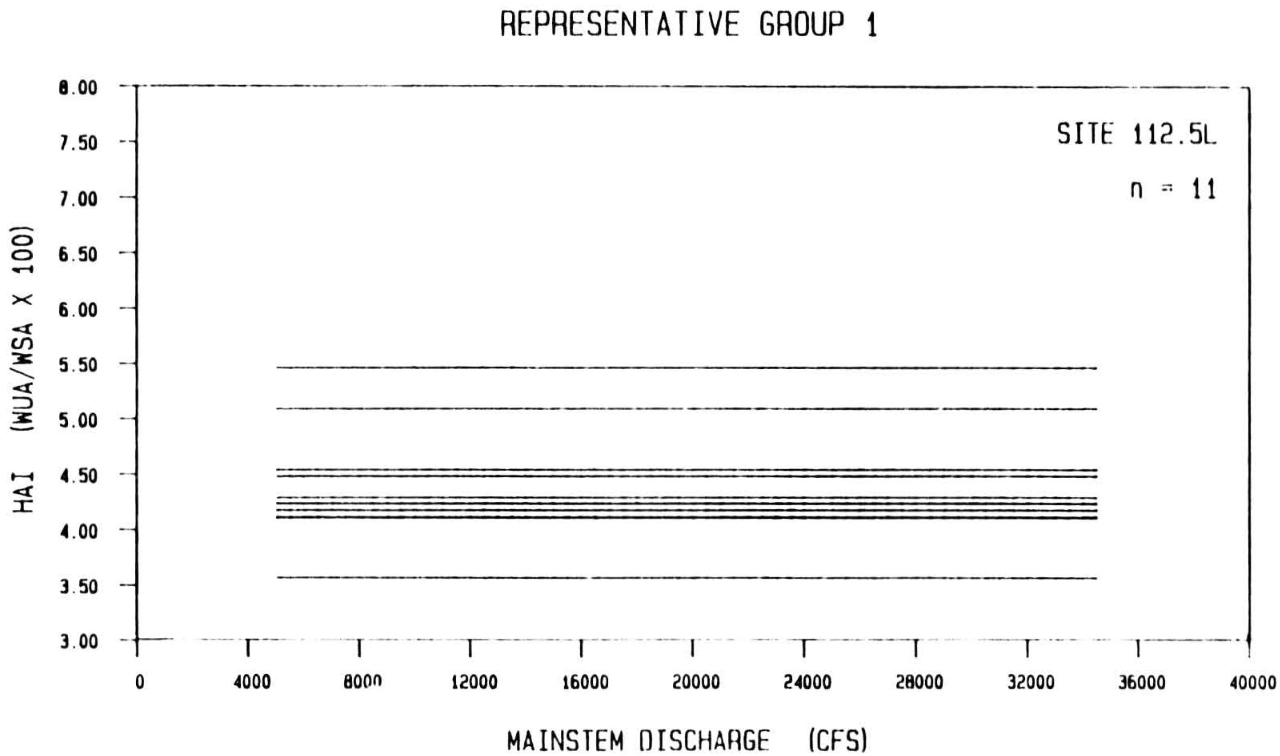


Figure 16. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 112.5L of Representative Group I.

flow increments of 500 cfs were multiplied by corresponding wetted surface area estimates interpolated from areas digitized from scaled aerial photography. The product of flow-specific HAI and WSA values are estimates of the total amount of WUA (in square feet) present at a particular site for mainstem flows ranging from 5,000 to 35,000 cfs. Aggregate WSA and WUA values were obtained for Representative Group I by summing individual specific area WSA and WUA forecasts. The results of these calculations are presented in Figure 17.

The overall response of juvenile chinook habitat for Group I sites is influenced by changes in backwater-related surface area and by the relative constancy of HAI values, particularly at lower flows. WUA tends to increase slightly as flows increase from 5,000 to 16,000 cfs; rearing habitat is maximal at the latter flow. Rearing habitat potential remains fairly constant between 16,000 and 35,000 cfs. It should be noted that the total amount of rearing habitat provided by Group I is small in comparison to other Representative Groups due to their comparatively low surface area and HAI values recorded for its individual specific areas.

3.2 Representative Group II

Associated with this group are modeling sites 101.4L, 113.7R, 126.0R and 144.4L. These sites are associated with side sloughs having moderately high breaching flows (> 20,000 cfs) and enough upwelling groundwater to keep portions of the sites ice-free during the winter months. Side sloughs classified in Representative Group II were found to contain significant

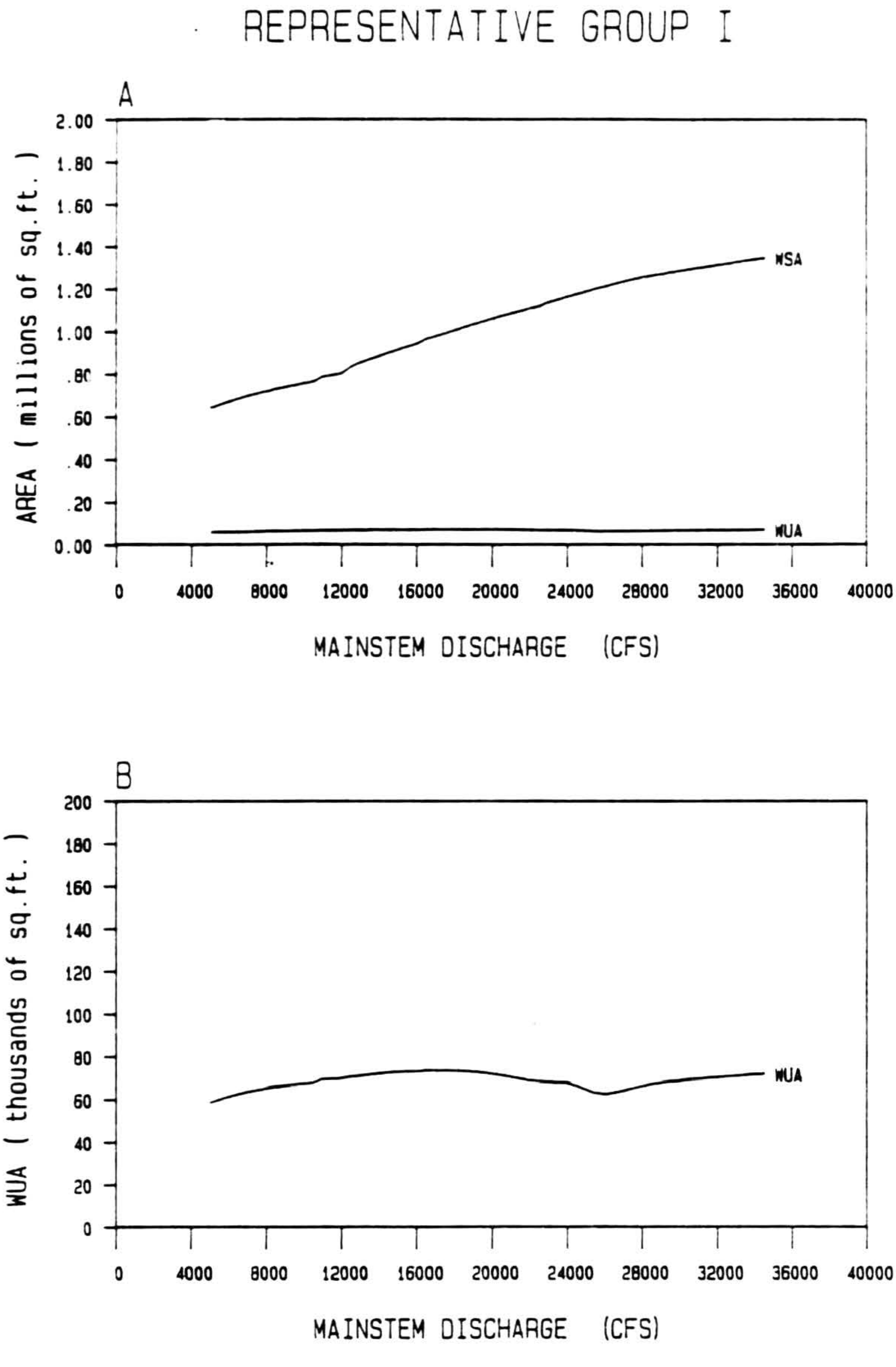


Figure 17. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group I of the middle Susitna River.

numbers of juvenile chinook during the growth season, particularly in their breached state (Dugan et al. 1984).

The 27 specific areas included in this group are typically oxbow channels separated from the mainstem by large, vegetated islands or gravel bars. When breached, these channels convey only a small percentage of the total mainstem flow. They are characterized further by relatively high length-to-width ratios and lower gradients than are found in the adjacent mainstem. Cross-sections vary from relatively broad, uniform and rectangular in shape to narrow, irregular and v-shaped in profile. Head berms generally fall in the former category. Backwater areas occur at the mouths of most specific areas within Group II but their effects on hydraulic conditions and therefore juvenile chinook habitat are not as extensive as those observed for upland sloughs since side sloughs possess slightly higher gradients. Substrates range from silt and sand in backwater areas to rubble/cobble/boulder throughout the rest of the site. These sites tend to possess abundant macrophytic vegetation.

Aerial photography indicating the general features of modeling sites 101.4L, 113.7R, 126.0R, and 144.4L and their associated specific areas at 23,000 and 16,000 cfs are presented in Plates A-3, A-4, A-5, and A-6 (Appendix A). The appearance of these sites does not change appreciably at mainstem flows below 16,000 cfs.

Response curves for wetted surface area (WSA) and habitat indices (WUA, HAI) developed for the four modeling sites within Group II exhibit strong similarities in appearance due to the dominant influence of shared hydrologic, hydraulic and morphologic properties (cf Figures 18-21). In the

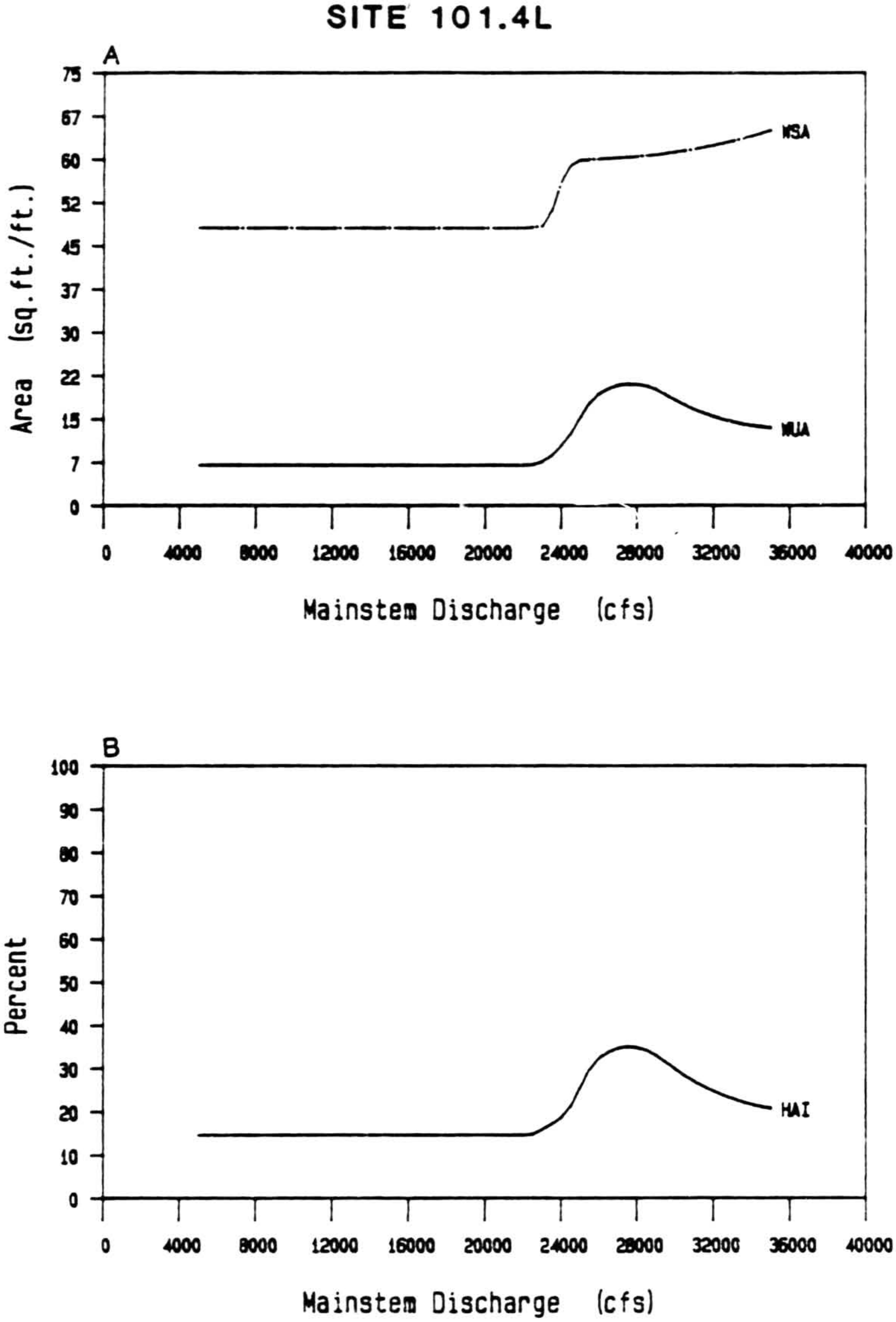


Figure 18. Surface area and chinook rearing habitat index response curves for modeling site 101.4L.
A- Wetted surface area (WSA) and weighted usable area (WUA).
B - Habitat availability index (HAI)

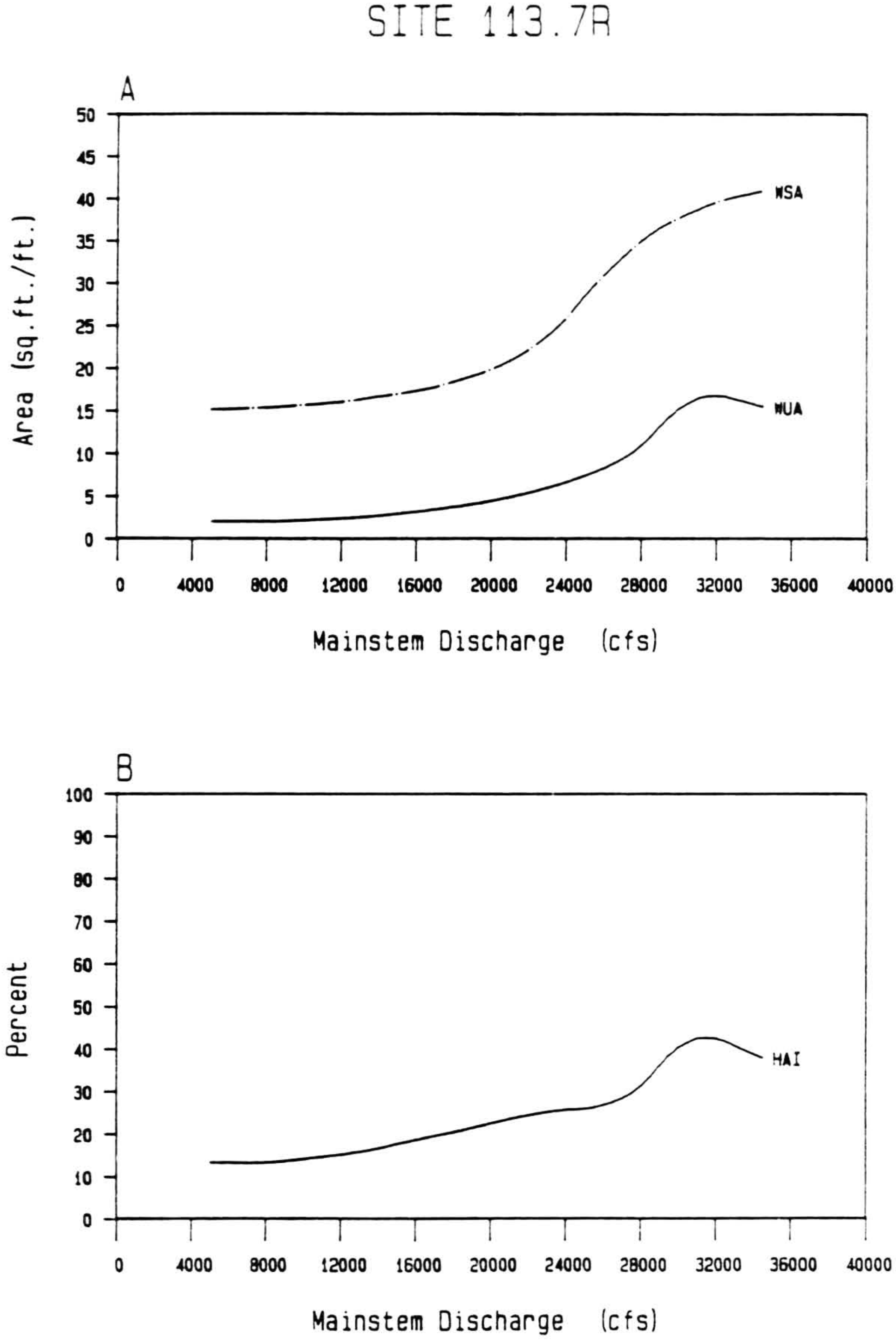


Figure 19. Surface area and chinook rearing habitat index response curves for modeling site 113.7R.
A- Wetted surface area (WSA), and weighted usable area (WUA).
B - Habitat availability index (HAI).

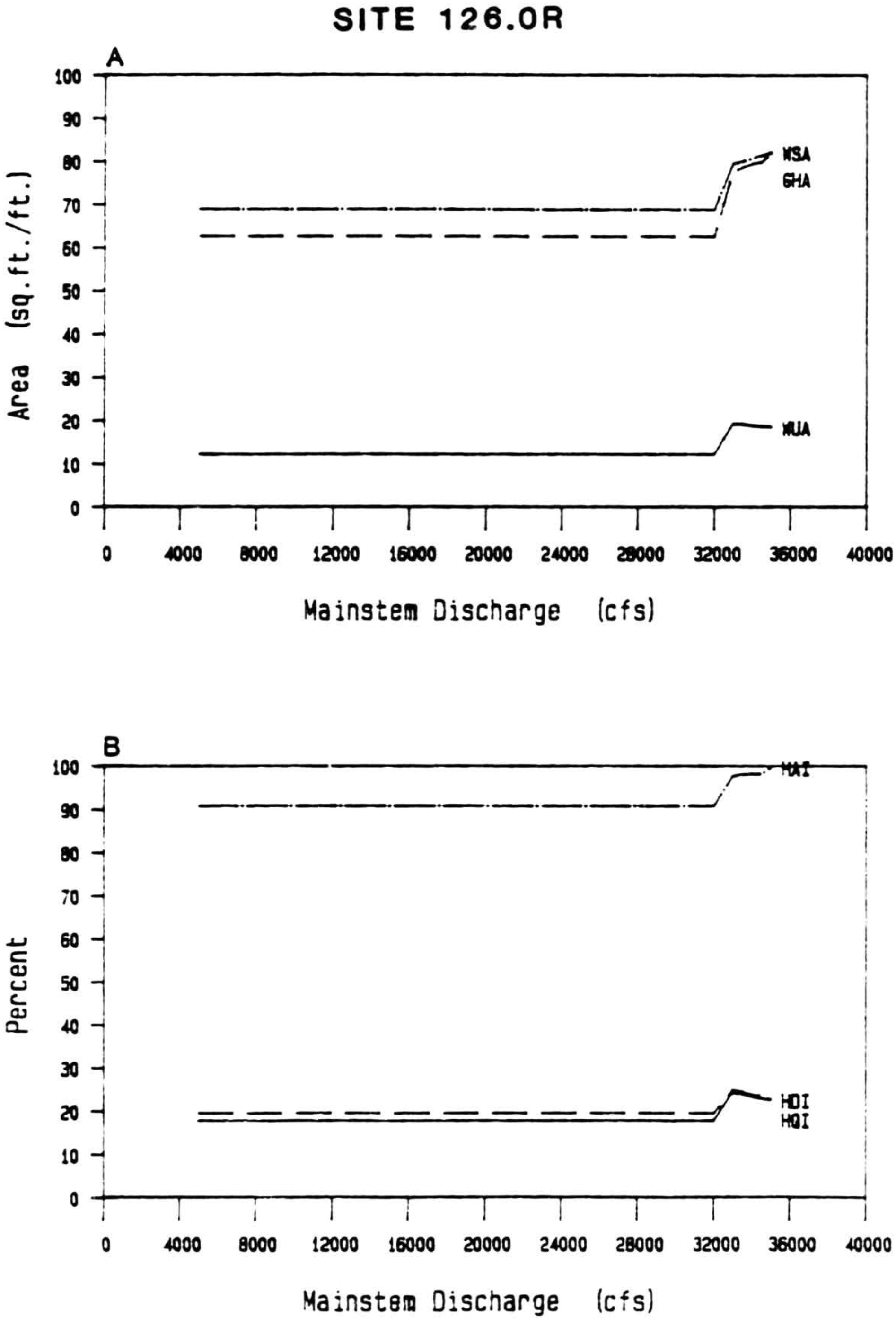


Figure 20. Surface area and chinook rearing habitat index response curves for modeling site 126.0R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

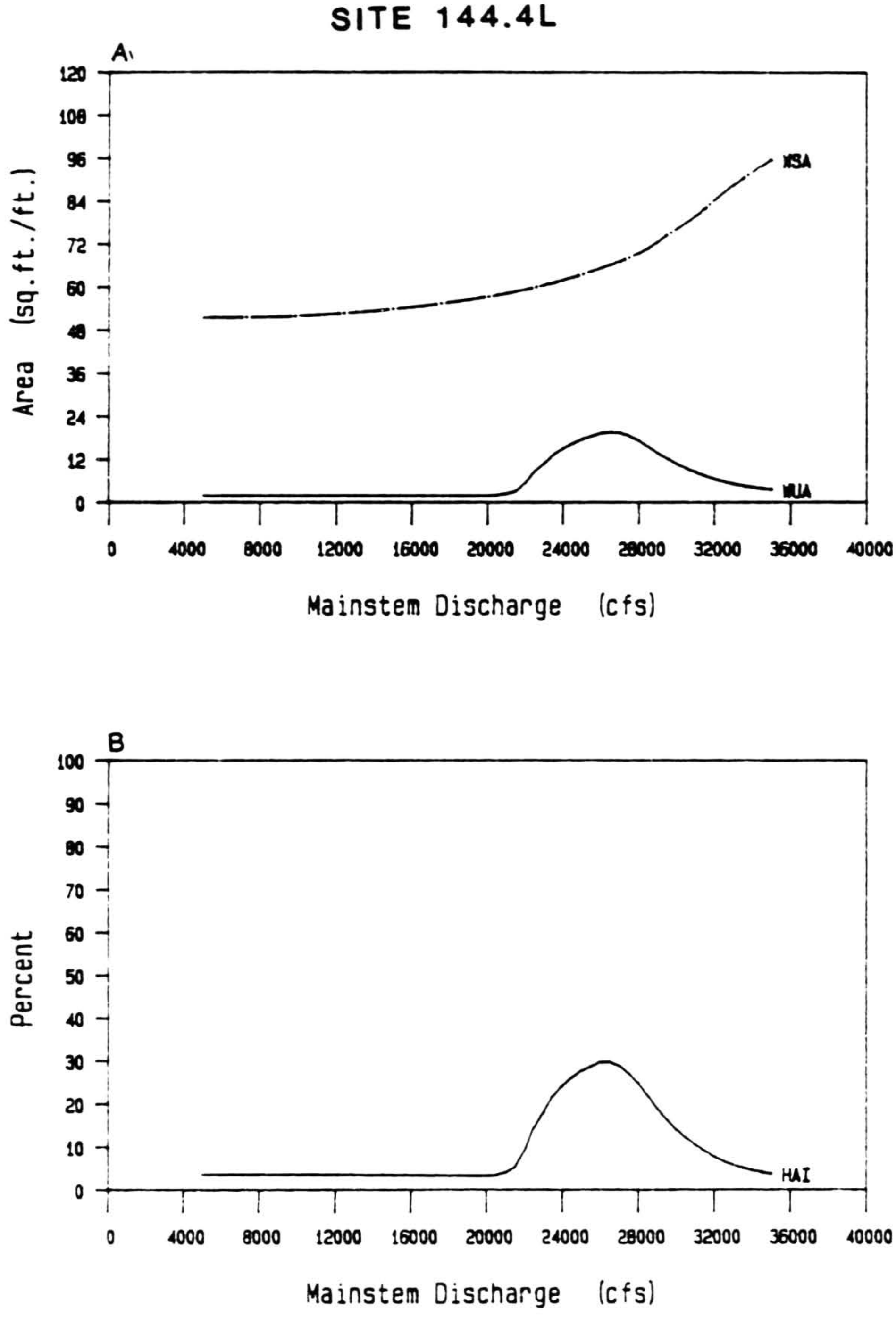


Figure 21. Surface area and chinook rearing habitat index response curves for modeling site 144.4L.
A- Wetted surface area (WSA) and weighted usable area (WUA).
B - Habitat availability index (HAI)

non-breached state, wetted surface areas remain relatively constant, responding primarily to local runoff and upwelling conditions. Following breaching, rapid increases in WSA occur in response to further changes in mainstem flow. Increases in WSA are attenuated as flows approach bank full levels.

Juvenile chinook WUA values simulated for Group II modeling sites are generally constant until the sites are breached, whereupon large increases occur in response to incremental changes in site flow. The amount of usable rearing habitat tends to peak shortly after the head berms are overtopped. This relatively sudden and rapid increase in juvenile chinook habitat results from a combination of factors: 1) the rapid accrual of wetted surface area, 2) the enhanced cover value provided by higher turbidities, and 3) the preponderance of velocities falling within the optimal preference range for juvenile chinook. In general, the magnitude of the WUA increase is proportional to the increase in wetted surface area possessing suitable velocities. Site velocities, however, soon become limiting in mid-channel areas following breaching, leading to a reduction in rearing WUA at higher flows.

On the basis of limited gross habitat (GHA) and habitat quality (HQI) data obtained for Site 126.0R (Figure 20), usable rearing habitat appears to be more uniformly distributed and of better quality at flows associated with the ascending left hand limb of the WUA curve than at non-breached or high mainstem discharges. Under non-breached conditions, unsuitably shallow depths often occur in riffle areas of the site, resulting in slightly lower HDI values. Although surface area and habitat indices for Site 126.0R were not extrapolated to flows exceeding 35,000 cfs, it is likely that juvenile chinook habitat becomes more restricted to peripheral areas as mid-channel velocities increase.

Aaserude et al. (1984) report identical structural habitat (SHI) values for modeling sites 113.7R and 126.0R; these sites collectively represent 15 of the 27 specific areas within Group II. Breaching flows were used to divide these 15 areas among the two modeling sites. Specific areas breaching at flows exceeding 28,000 were grouped with Site 126.0R, which is overtopped at 33,000 cfs. The 13 other specific areas, all breaching at 27,000 cfs or less, are represented by Site 113.7R, which breaches at 24,000 cfs. Site 144.4L has a higher SHI value than the other modeling sites and represents 7 of the specific areas in Group II. Site 101.4L may be considered representative of the remaining 5 specific areas. HAI functions are plotted for specific areas associated with each of these modeling sites in Figures 22 through 25. HAI values used to plot these curves are tabulated in Appendix B.

Figure 26 depicts the aggregate WUA curve obtained by multiplying Group II specific area HAI values by their wetted surface areas and summing the results for each flow of interest. Because of their high breaching flows, most specific areas exhibit peak HAI values in the range of 20,000 to 30,000 cfs. When adjusted by their wetted surface areas these sites yield cumulative WUA values which increase slowly at low to intermediate flows, increase more rapidly after this point and peak at 29,000 cfs. Approximately 1.2 million square feet of juvenile chinook WUA is provided by Group II specific areas at this discharge. The large differences in WUA over the range of evaluation flows indicate that rearing habitat potential

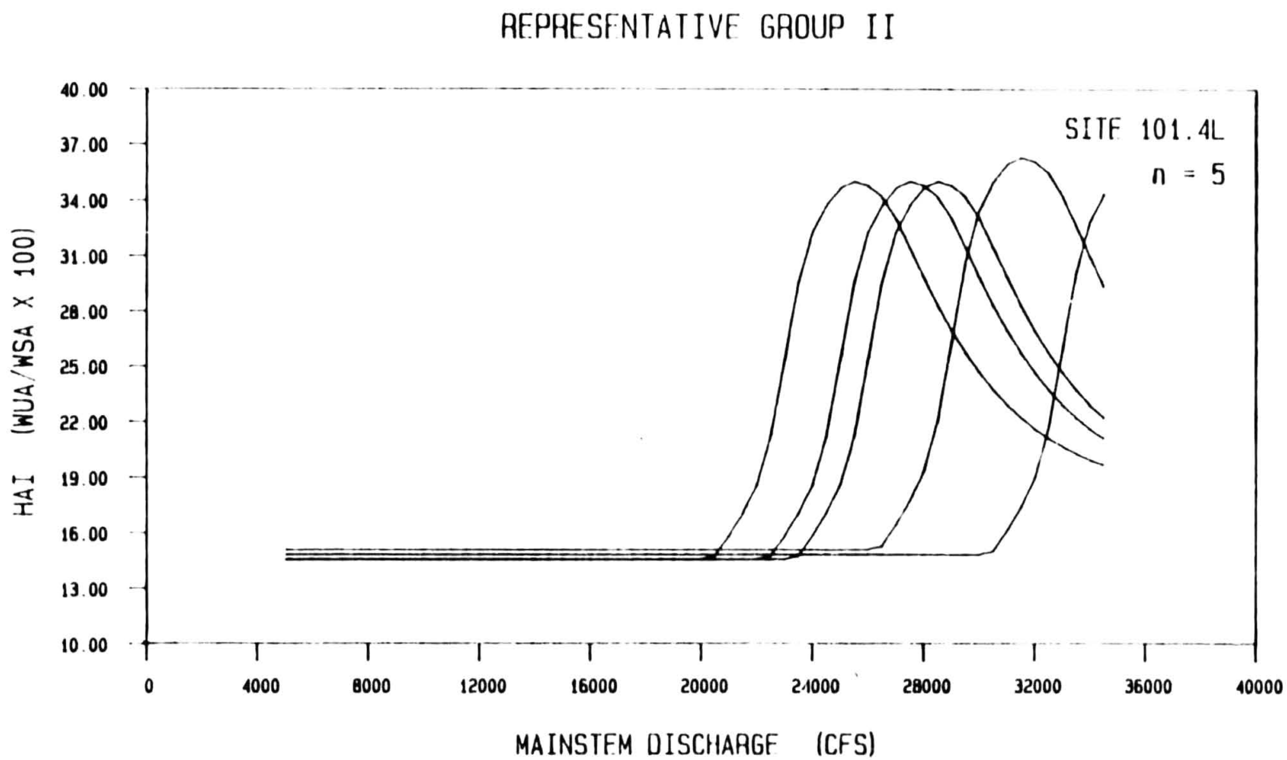


Figure 22. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 101.4L of Representative Group II.

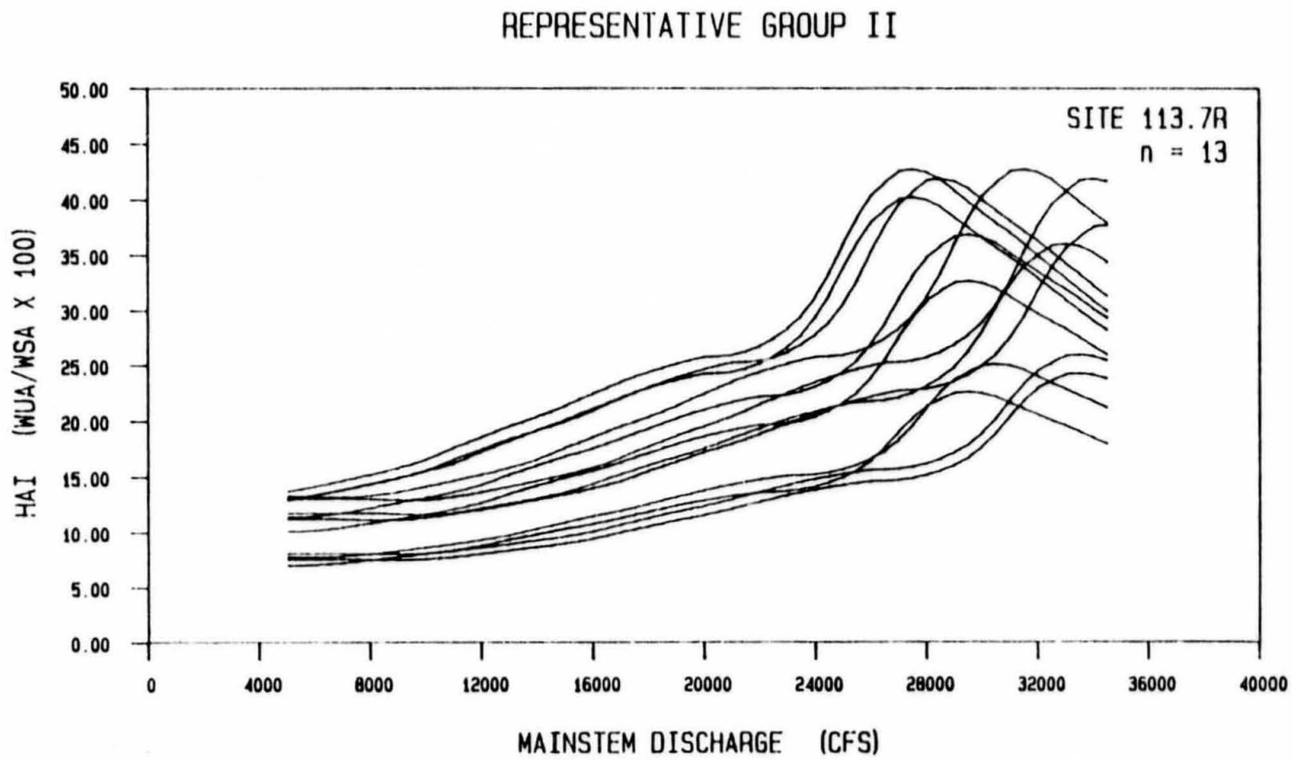


Figure 23. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 113.7R of Representative Group II.

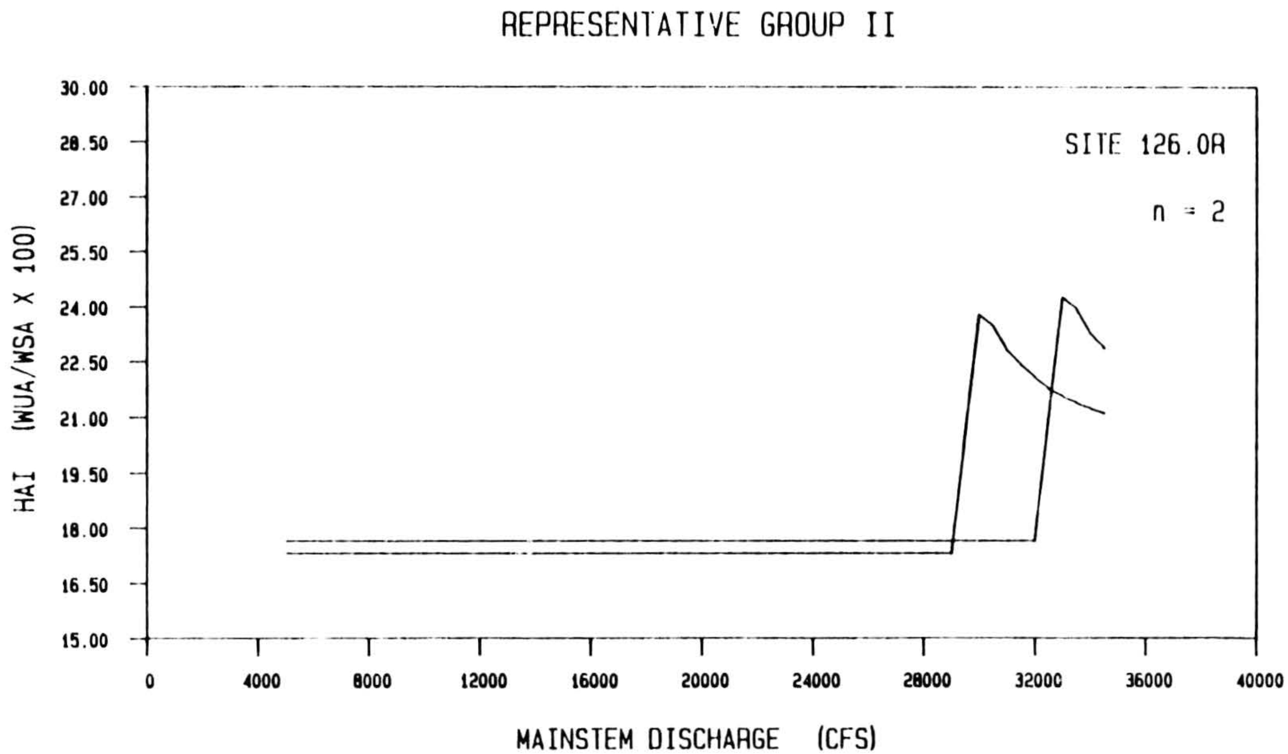


Figure 24. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 126.0R of Representative Group II.

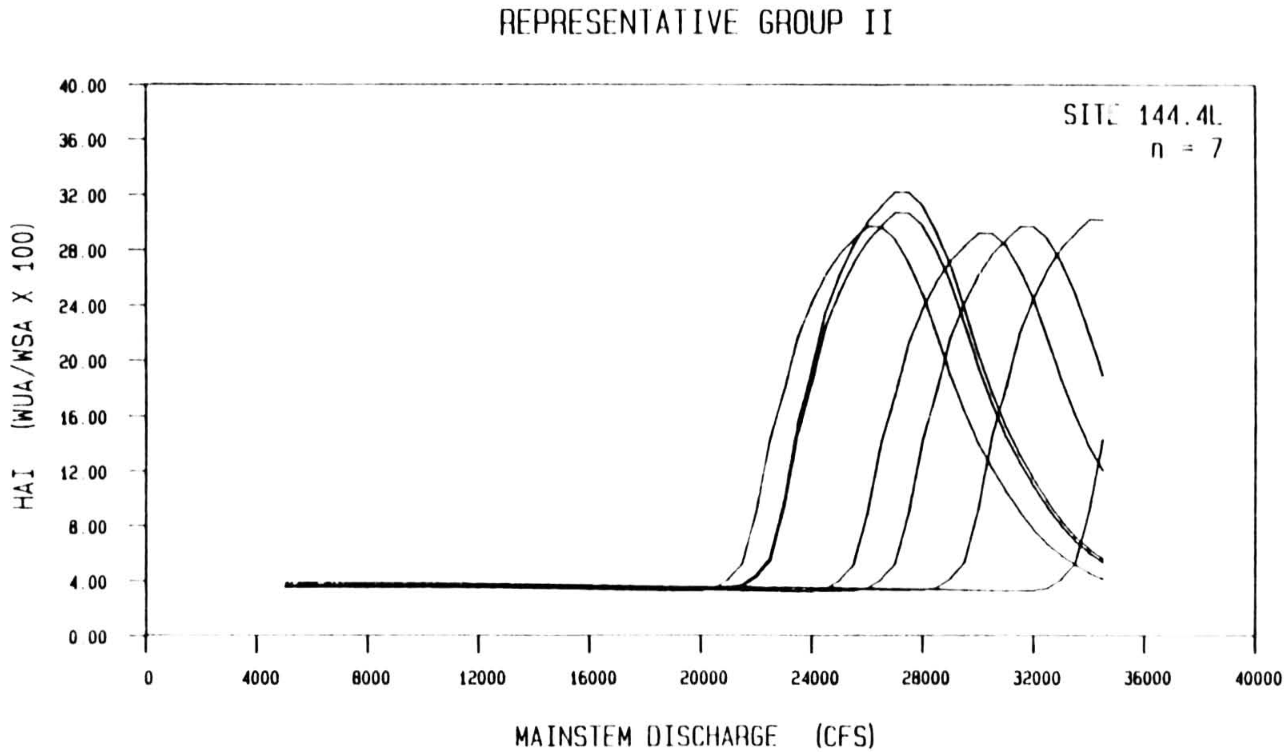


Figure 25. **Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 144.4L of Representative Group II.**

REPRESENTATIVE GROUP II

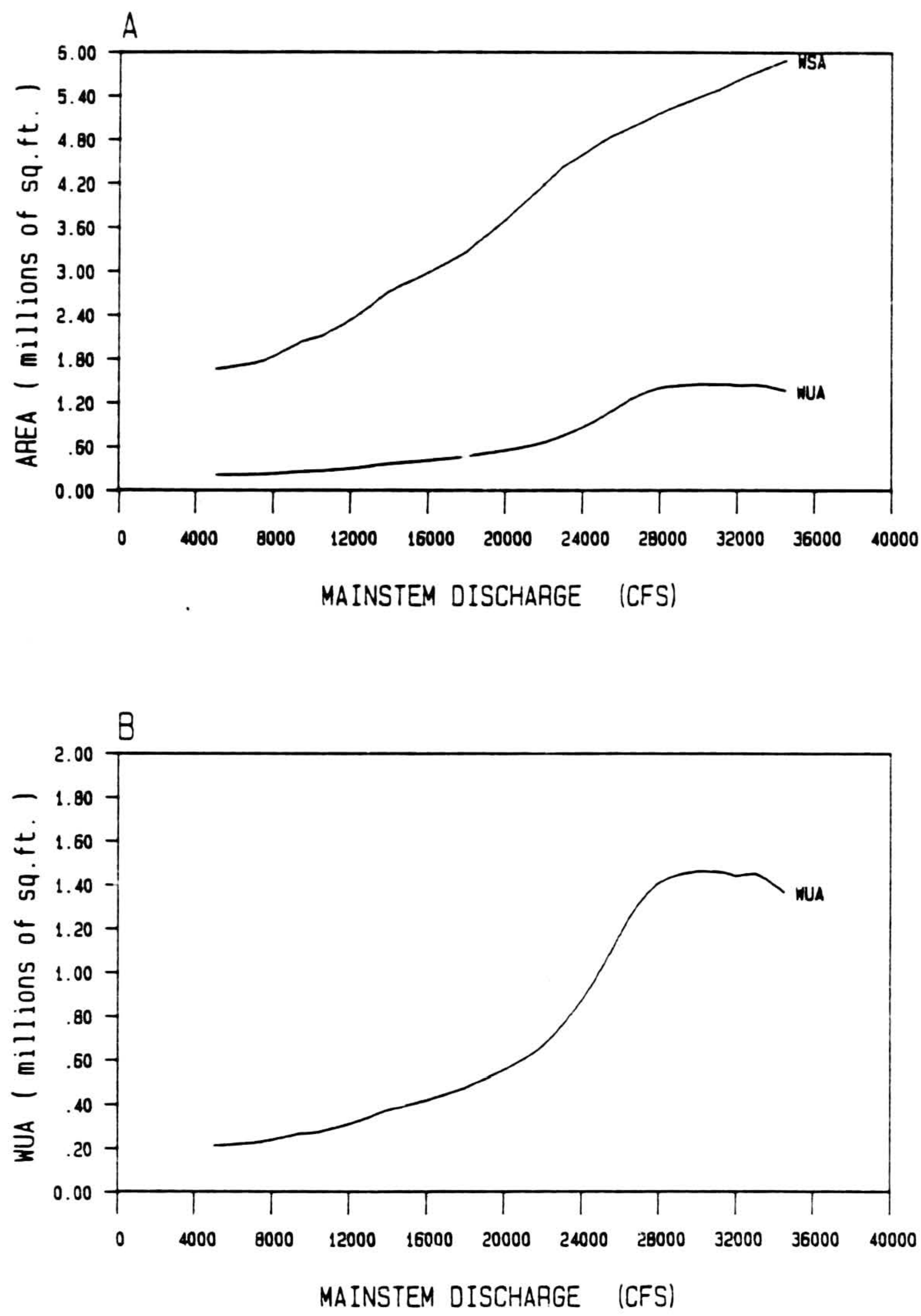


Figure 26. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group II of the middle Susitna River.

in Representative Group II as a whole may be considered highly sensitive to fluctuations in mainstem flow. Figure 26 also illustrates aggregate WSA response for Representative Group II.

3.3 Representative Group III

Sites 101.2R, 128.8R, 132.6L and 141.4R are all side channels which become nonbreached at intermediate (8,000 to 16,000 cfs) mainstem discharge levels, and transform into side sloughs at lower discharges. These modeling sites and the Group III specific areas they represent, shown in Plates A-7 through A-14 (Appendix A), are larger and convey greater volumes of water when breached than the side sloughs discussed in the preceding section. Site geometry tends toward broad, concave cross-sections. Reach gradients are less than those measured for the adjacent mainstem, yet great enough to promote mid-channel velocities of 2 to 5 fps following breaching. Consequently, substrate is dominated by larger bed materials. Upwelling occurs sporadically within these specific areas and in a few cases may be insufficient to provide for passage between clearwater pools formed at low mainstem flows.

The specific areas comprising Group III represent some of the most heavily utilized rearing areas in the middle segment of the Susitna River. Juvenile chinook are found in these areas primarily under turbid water conditions (Dugan et al. 1984).

Surface area and juvenile chinook habitat response curves are portrayed in Figures 27, 28 and 30 for modeling sites 101.2R, 128.8R and 141.4R, respectively. These sites were modeled using IFG hydraulic simulation

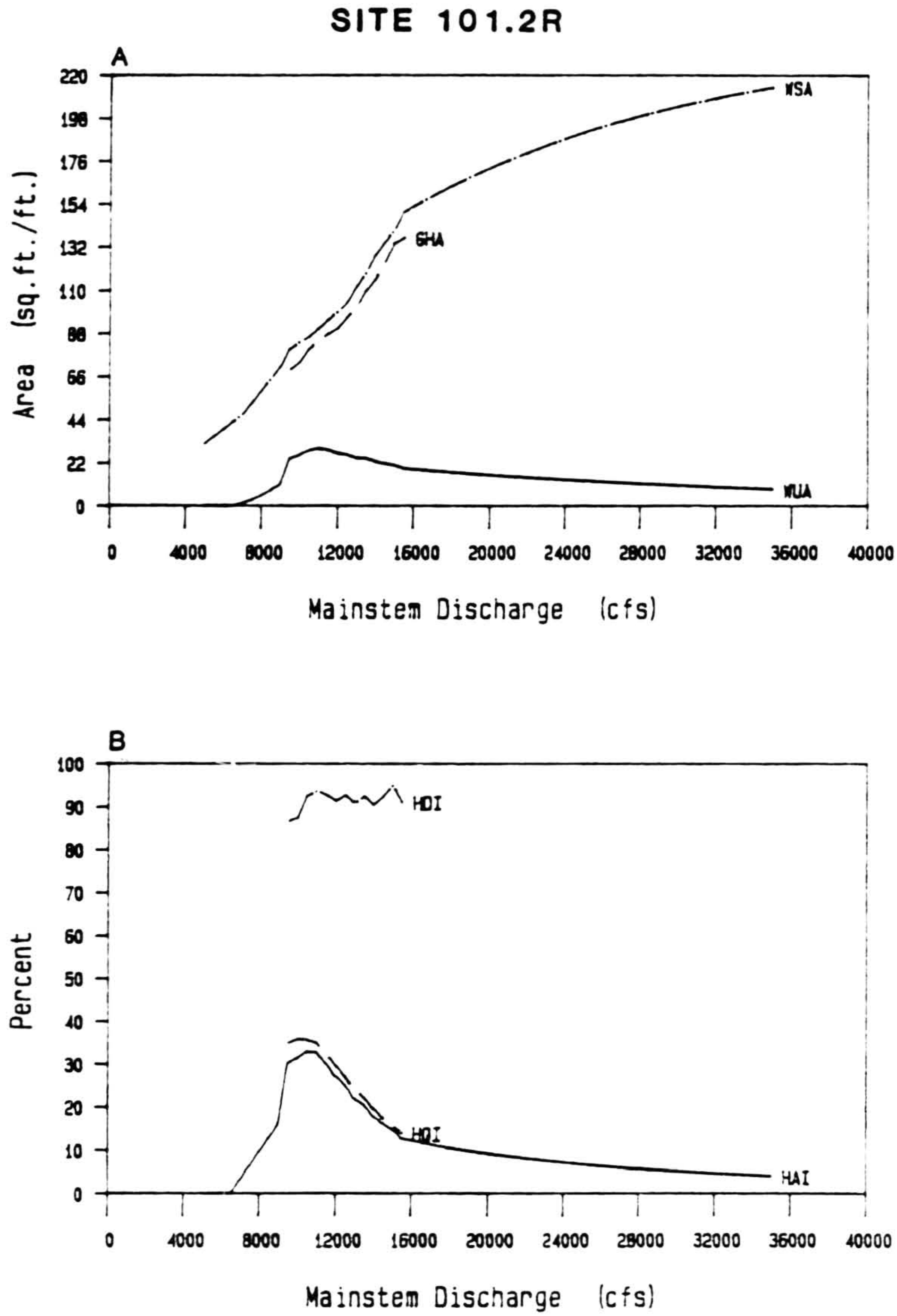


Figure 27. Surface area and chinook rearing habitat index response curves for modeling site 101.2R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

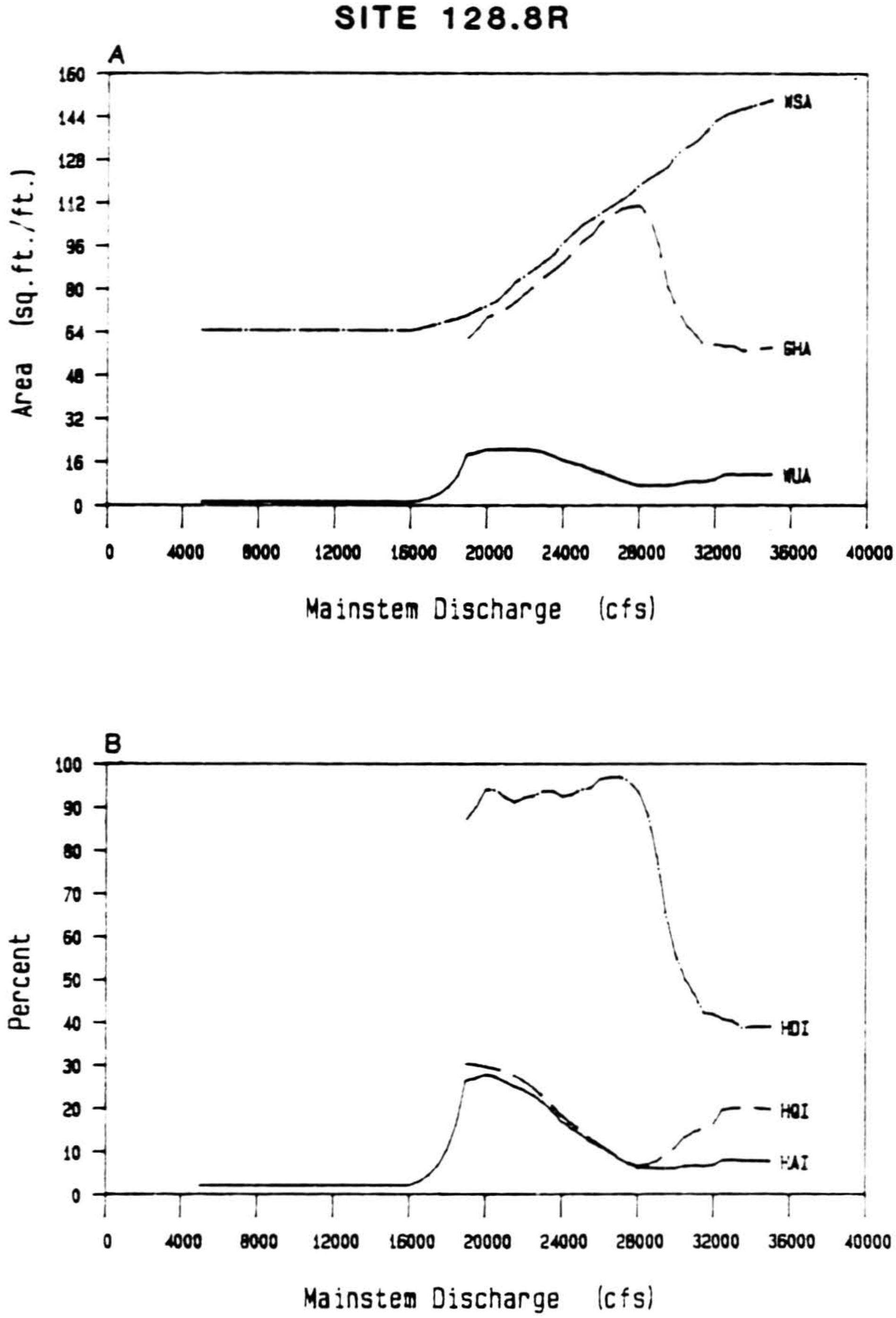


Figure 28. Surface area and chinook rearing habitat index response curves for modeling site 128.8R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

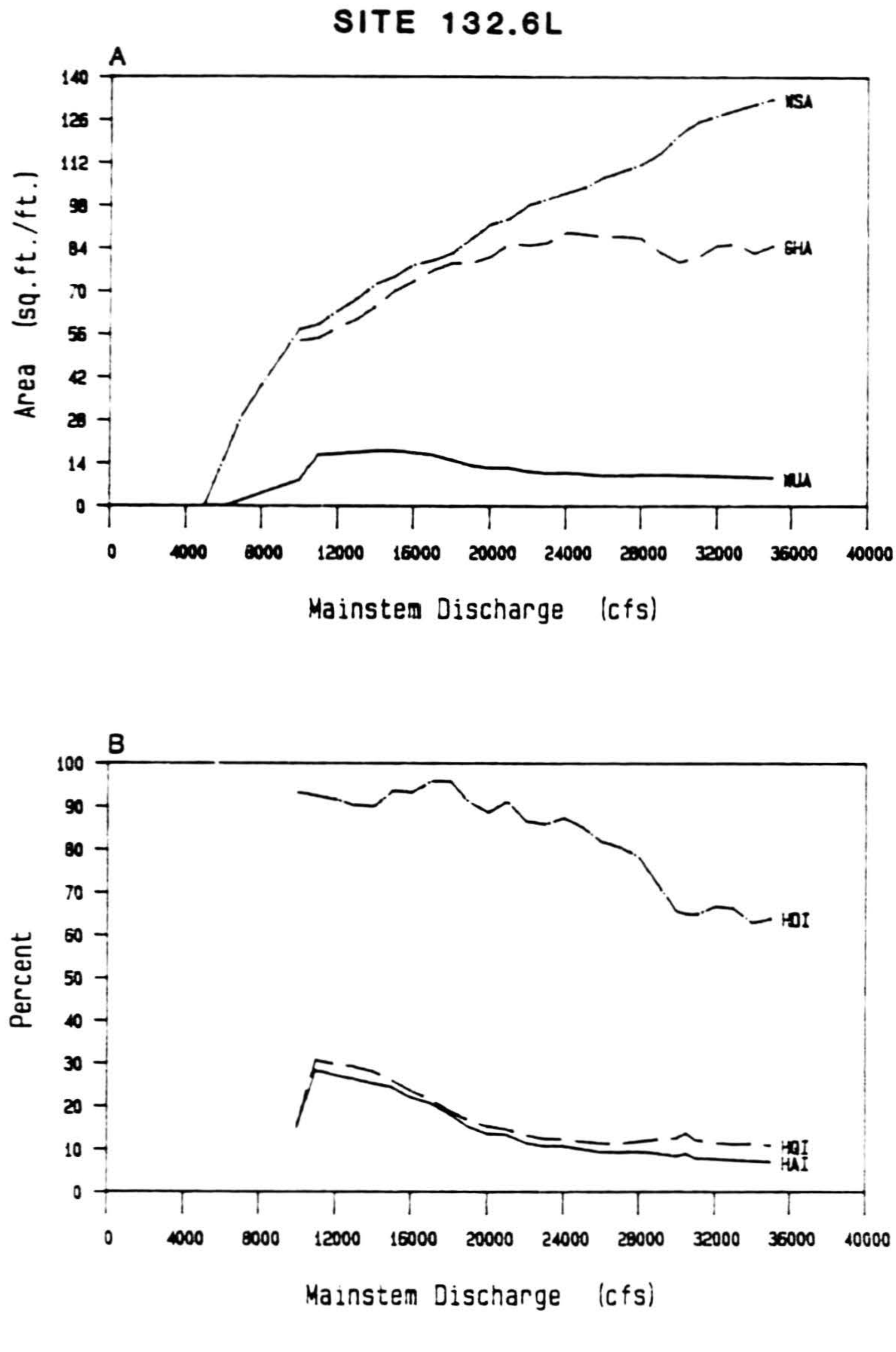


Figure 29. Surface area and chinook rearing habitat index response curves for modeling site 132.6L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

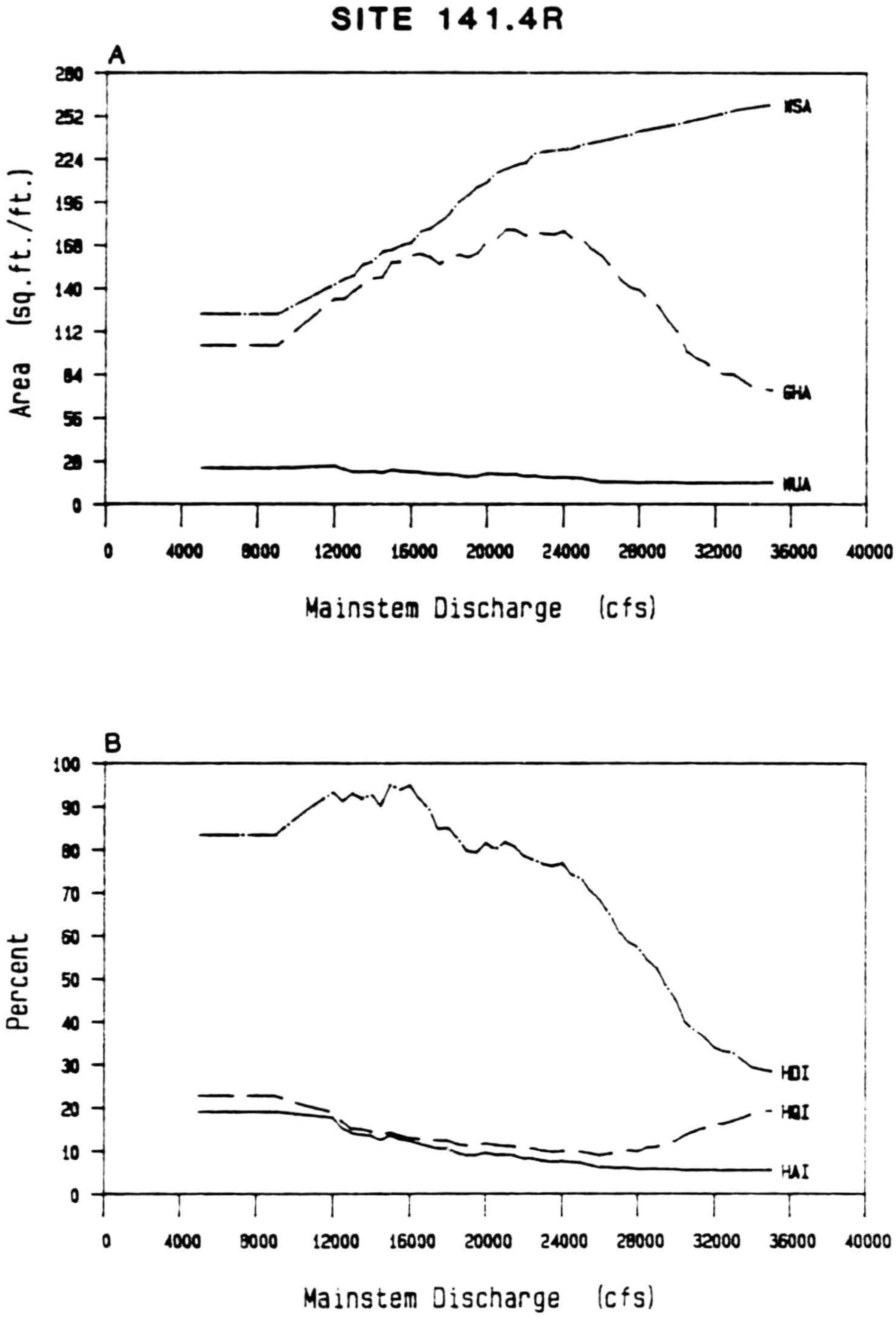


Figure 30. Surface area and chinook rearing habitat index response curves for modeling site 141.4R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

models coupled with the HABTAT model of the PHABSIM system. A fourth site, 132.6L was modeled using both PHABSIM and RJHAB modeling techniques applied to separate sets of data. Results for this site are found in Figure 29.

An inspection of the aerial photography (Plates A-7 through A-14, Appendix A) WSA curves developed for the modeling sites suggests a rapid response of wetted surface area to changes in mainstem discharge following breaching. This response is paralleled by changes in gross habitat area until moderately high flows are attained, when the proportion of wetted surface area possessing usable rearing habitat falls off. Peak HDI values for the modeling sites typically range from 95 to 97 percent. These maxima usually occur at much higher flows than those associated with peak WUA values. Therefore, the quality of usable rearing habitat, as measured by the HQI index, tends to decline at higher flows; i.e., a greater proportion of the total WUA is concentrated in a smaller area within the modeling sites. This decline is caused by shifts in velocities in the majority of cells toward the suboptimal end of the velocity suitability curve.

Usable habitat within Group III specific areas during the non-breached phase is generally minimal due to a reduction in suitability caused by increased water clarity. Specific areas represented by Site 141.4R are an exception to this rule because of the widespread occurence of suitable depth/velocity cells. The enhanced cover conditions afforded by increased turbidity levels at this site are offset by a rapid decline in suitable velocities following breaching.

Of the 17 specific areas classified within Group III, 16 are represented by Sites 101.2R, 128.8R, and 132.6L. Site 141.4R is considered atypical due to its larger size and discharge under non-breached conditions. Therefore, the only specific area assigned to this modeling site was the one in which the modeling site was found. Modeling results for Sites 101.2R and 132.6L were used to develop specific area HAI functions for 7 and 5 specific areas, respectively. Site 128.8R was used to represent 4 specific areas possessing relatively poor structural habitat quality.

Figures 31 to 34 illustrate HAI functions derived from modeling site habitat data and underscore the singularity of the habitat response to flow at Site 141.4R. HAI curves developed for the remainder of the other modeling sites in this representative group exhibit a strong unimodal peak in HAI following breaching, whereas the HAI response to increasing discharge at Site 141.4R is to progressively decrease for reasons stated above.

A comparison of the magnitudes and shapes of the WSA, WUA and HAI curves derived for Site 132.6L (Figure 29) suggests that the RJHAB and PHABSIM modeling approaches yield similar results. The RJHAB method appears well-suited to smaller channels where cross-sectional profiles (i.e., velocity and depth distributions) and cover characteristics are relatively homogeneous. We recommend limiting the use of RJHAB modeling techniques primarily to baseline evaluations of fish habitat in lotic subenvironments meeting these constraints.

The aggregate WUA function derived from individual rearing habitat response curves for specific areas in Representative Group III exhibits a pronounced peak in the vicinity of 15,500 cfs (Figure 35). The amount of juvenile

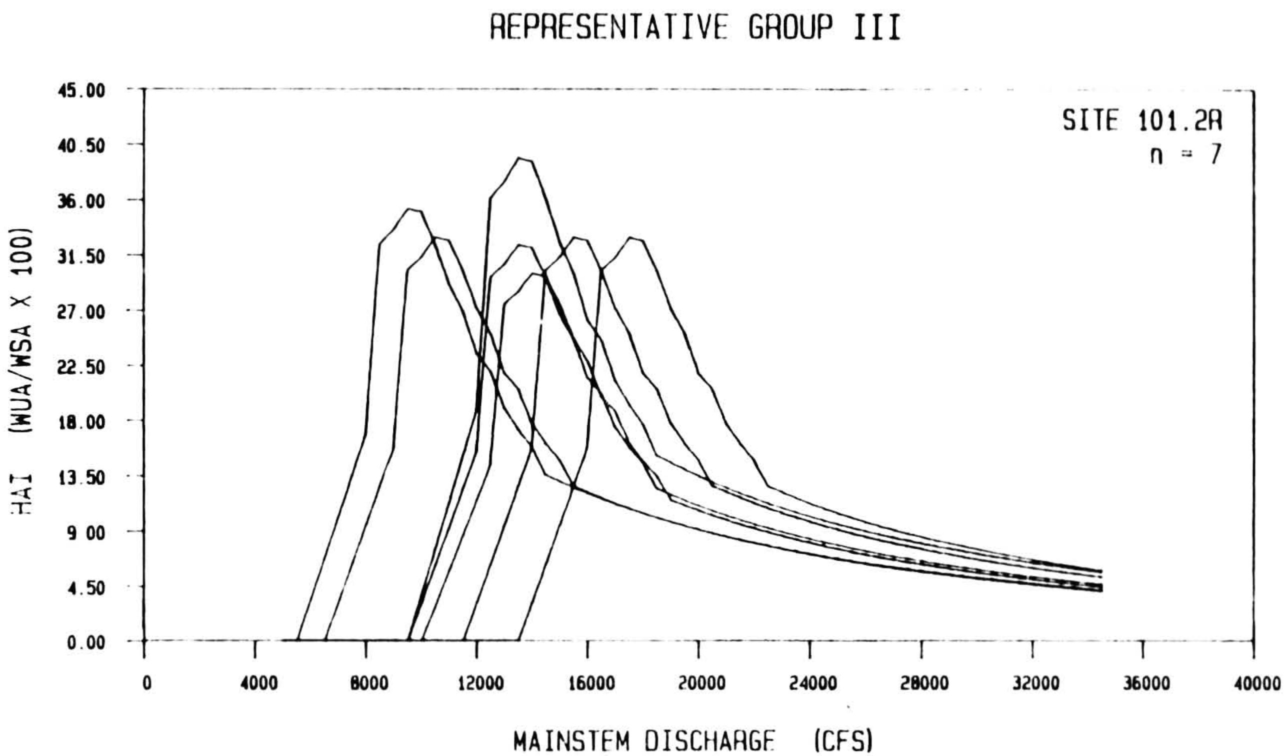


Figure 31. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 101.2R of Representative Group III.

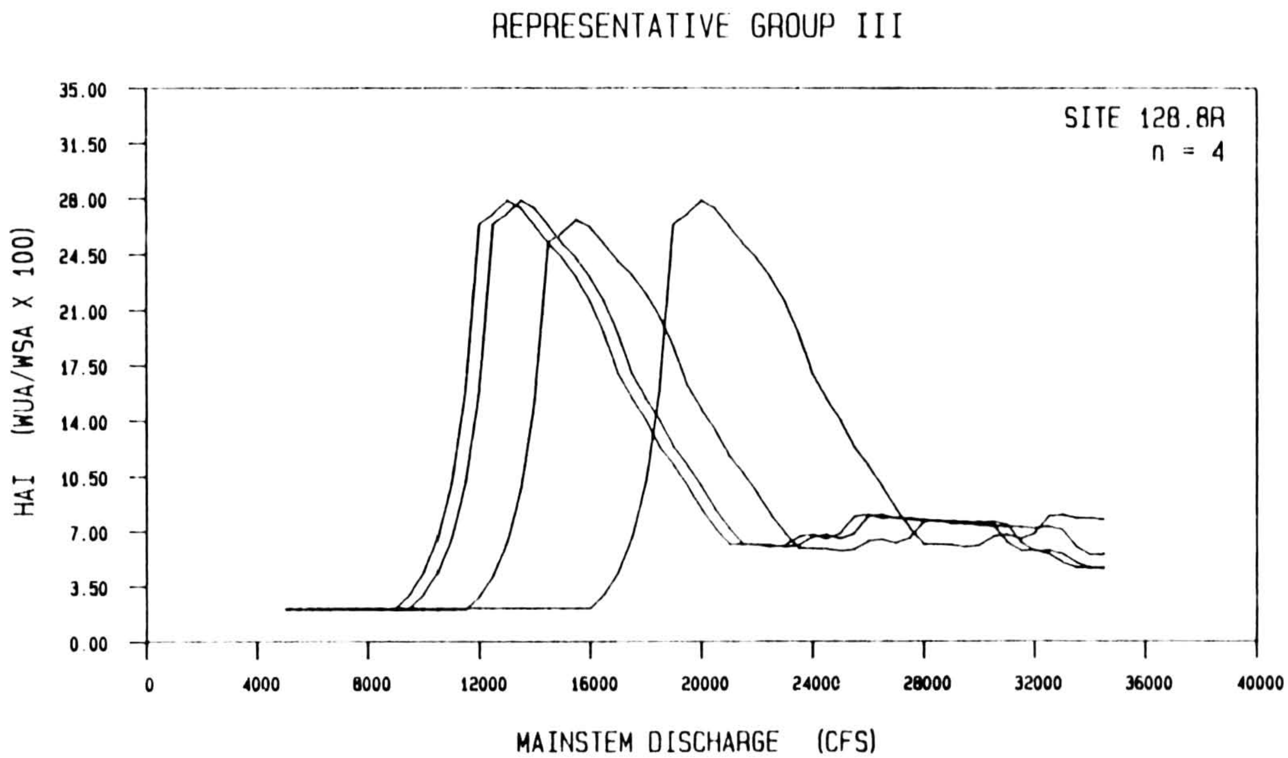


Figure 32. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 128.8R of Representative Group III.

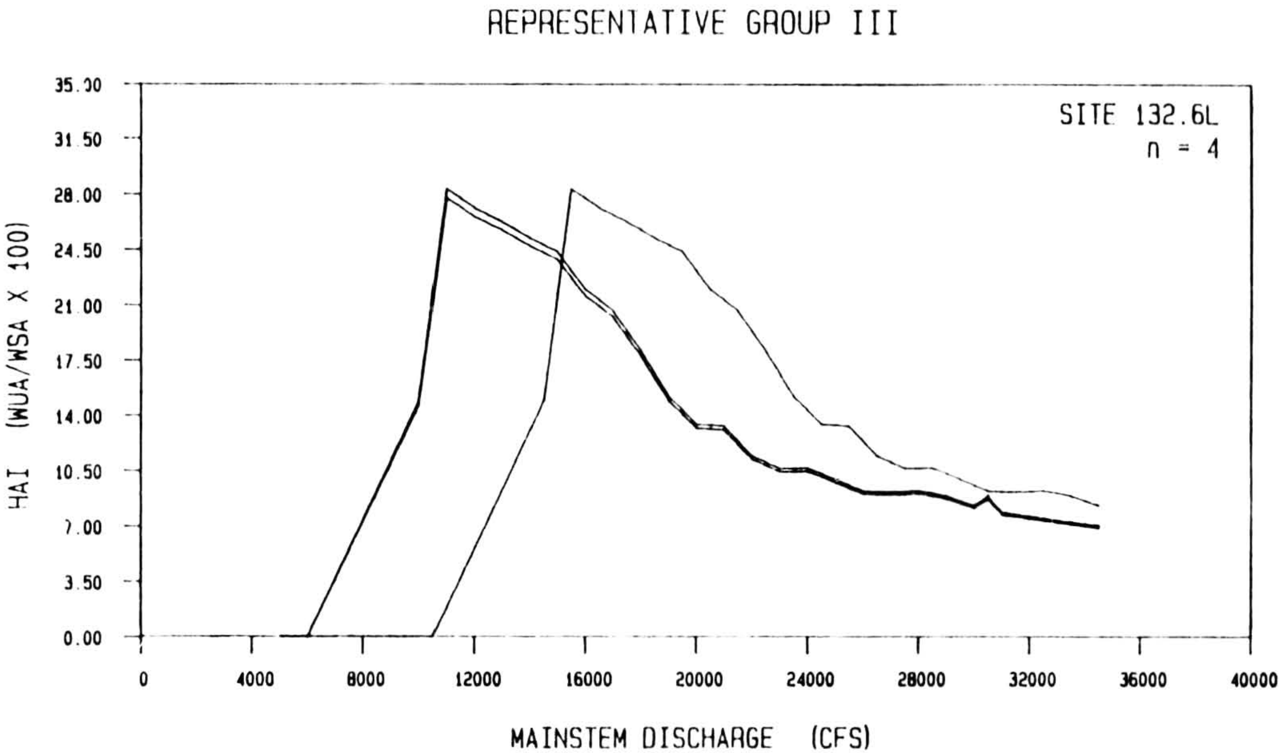


Figure 33. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 132.6L of Representative Group III.

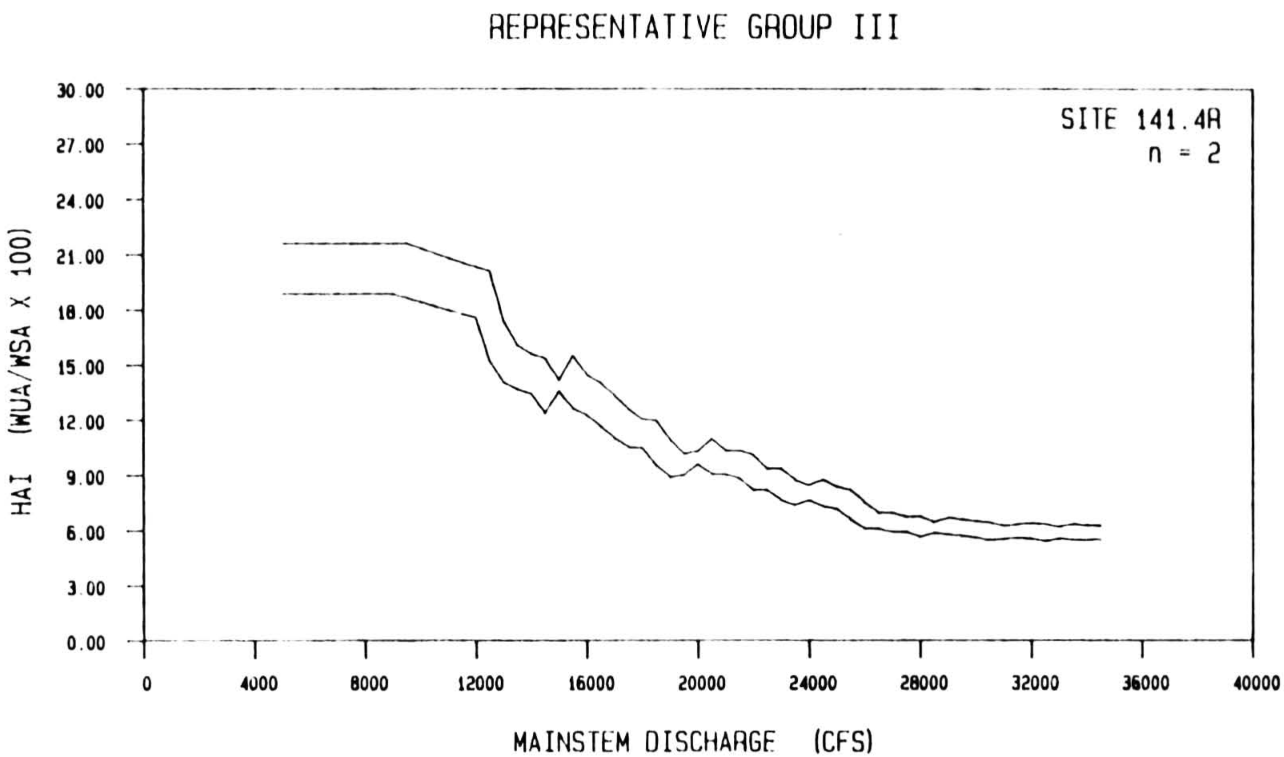


Figure 34. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 141.4R of Representative Group III.

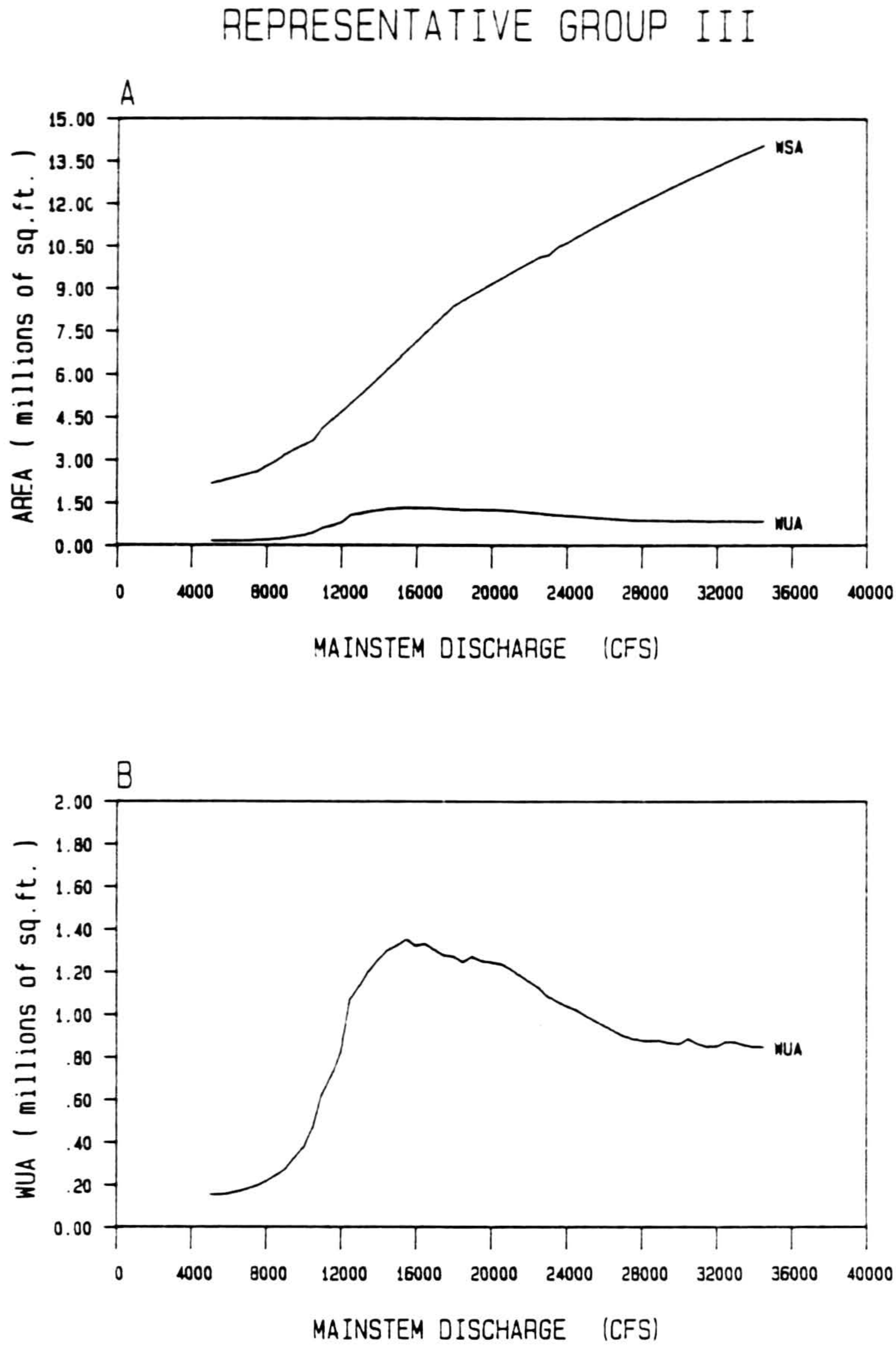


Figure 35. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group III of the middle Susitna River.

chinook habitat provided by this flow (1.3 million square feet) represents an increase of 350 percent over WUA values forecast for 9,000 cfs (0.3 million square feet). This marked increase in usable habitat is directly attributable to the recruitment of side channel habitat within the 9,000 to 12,500 cfs flow range; 13 of the 17 specific areas which comprise Group III breach in this range (refer to Table 4 for site-specific breaching flows). After peaking at 15,000 cfs, juvenile chinook habitat gradually declines to 0.9 million square feet at 26,000 cfs and remains at this level through 35,000 cfs. Decreases in HAI values which occur within this range are offset by gains in total wetted surface area, resulting in relatively stable rearing habitat potential at higher flows.

3.4 Representative Group IV

Aaserude et al. (1985) delineates the 23 specific areas within this group on the basis of their low breaching discharges and intermediate to high mean reach velocities. The side channels which comprise these specific areas possess lower mean reach velocities than adjacent mainstem channels. Substrates range primarily from cobble to boulder.

Four modeling sites represent Group IV: 112.6L, 131.7L, 134.9R and 136.0L. Of these, Site 112.6L is the largest and Site 136.0L the smallest of the sites investigated. In spite of their disparity in size the modeling sites are characterized by similar surface area and habitat index response curves. Compare the aerial photographs of the modeling sites presented in Plates A-15 through A-22 (Appendix A) with the wetted surface curves in Figures 36 through 39. As is typical of most side channels of the middle river, wetted surface area responds to changes in streamflow more rapidly

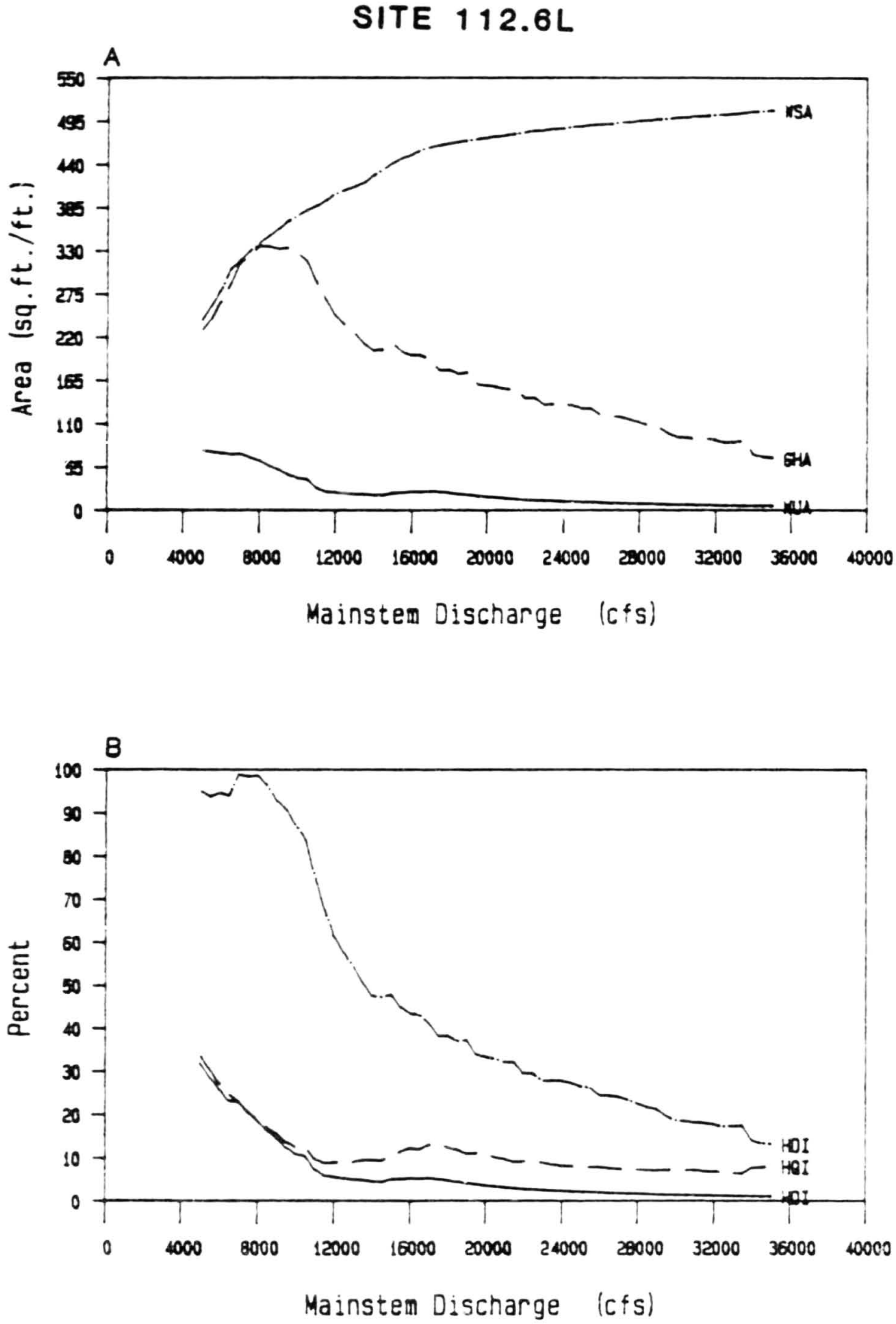


Figure 36. Surface area and chinook rearing habitat index response curves for modeling site 112.6L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

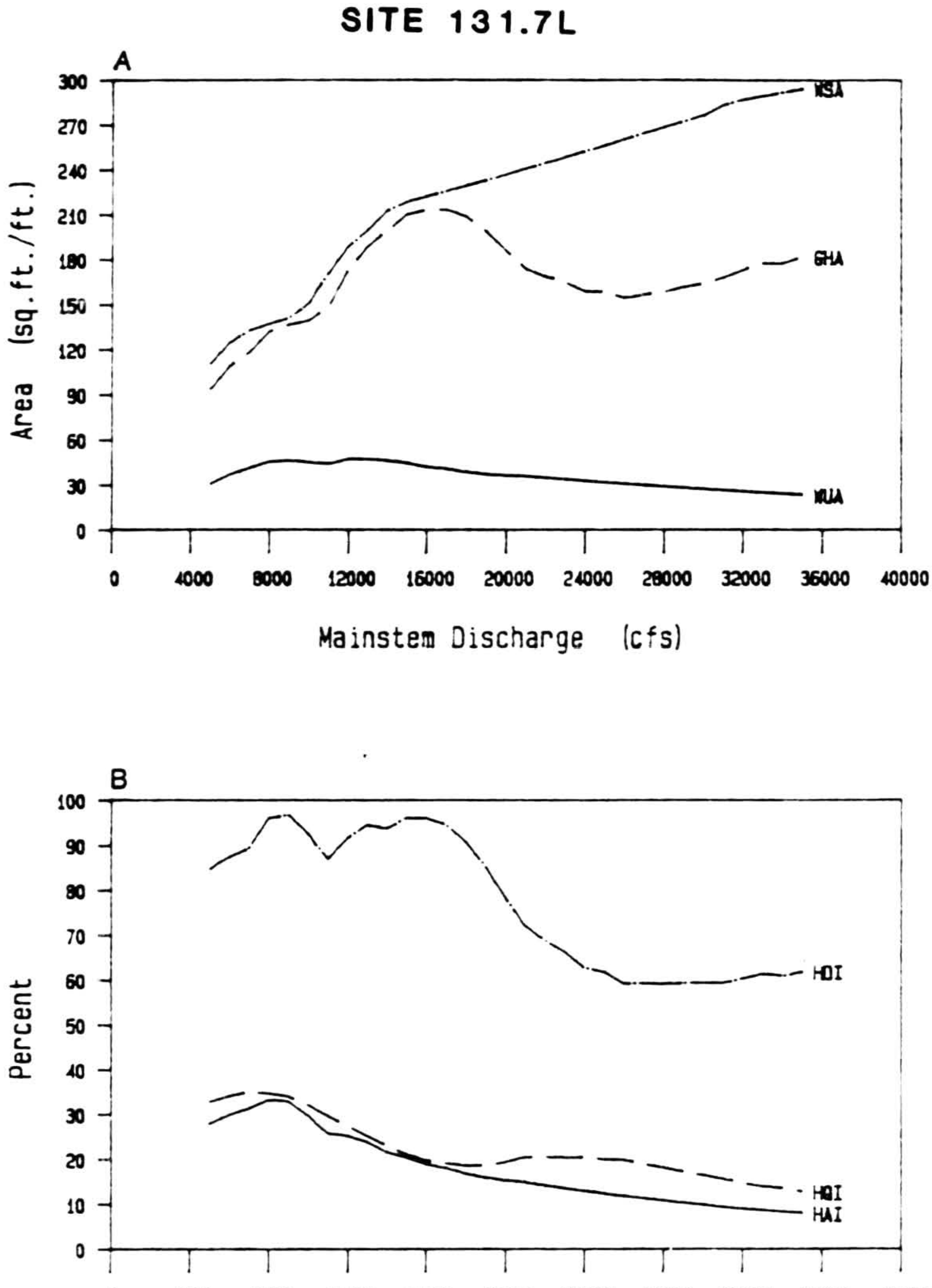


Figure 37. Surface area and chinook rearing habitat index response curves for modeling site 131.7L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

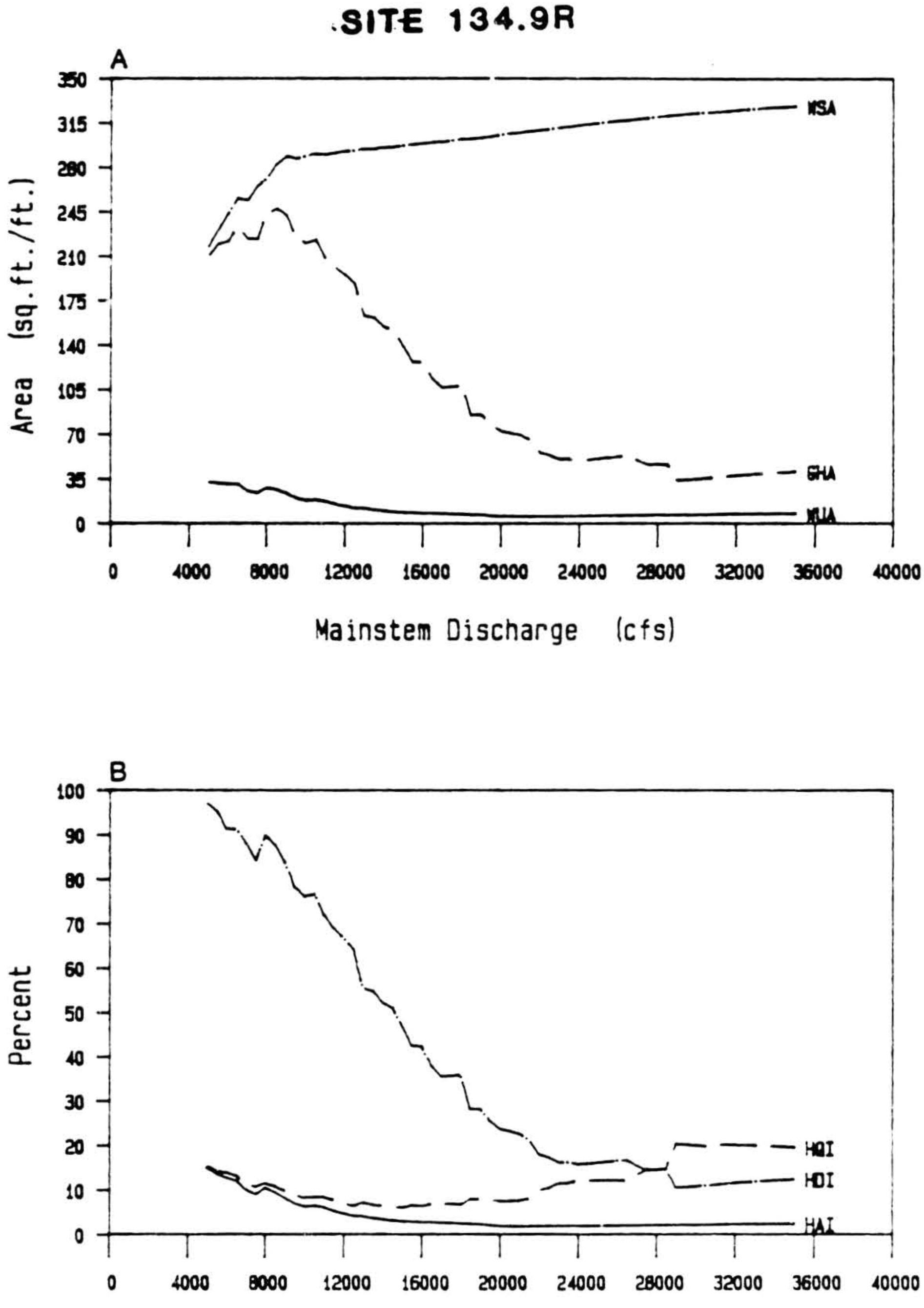


Figure 38. Surface area and chinook rearing habitat index response curves for modeling site 134.9R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

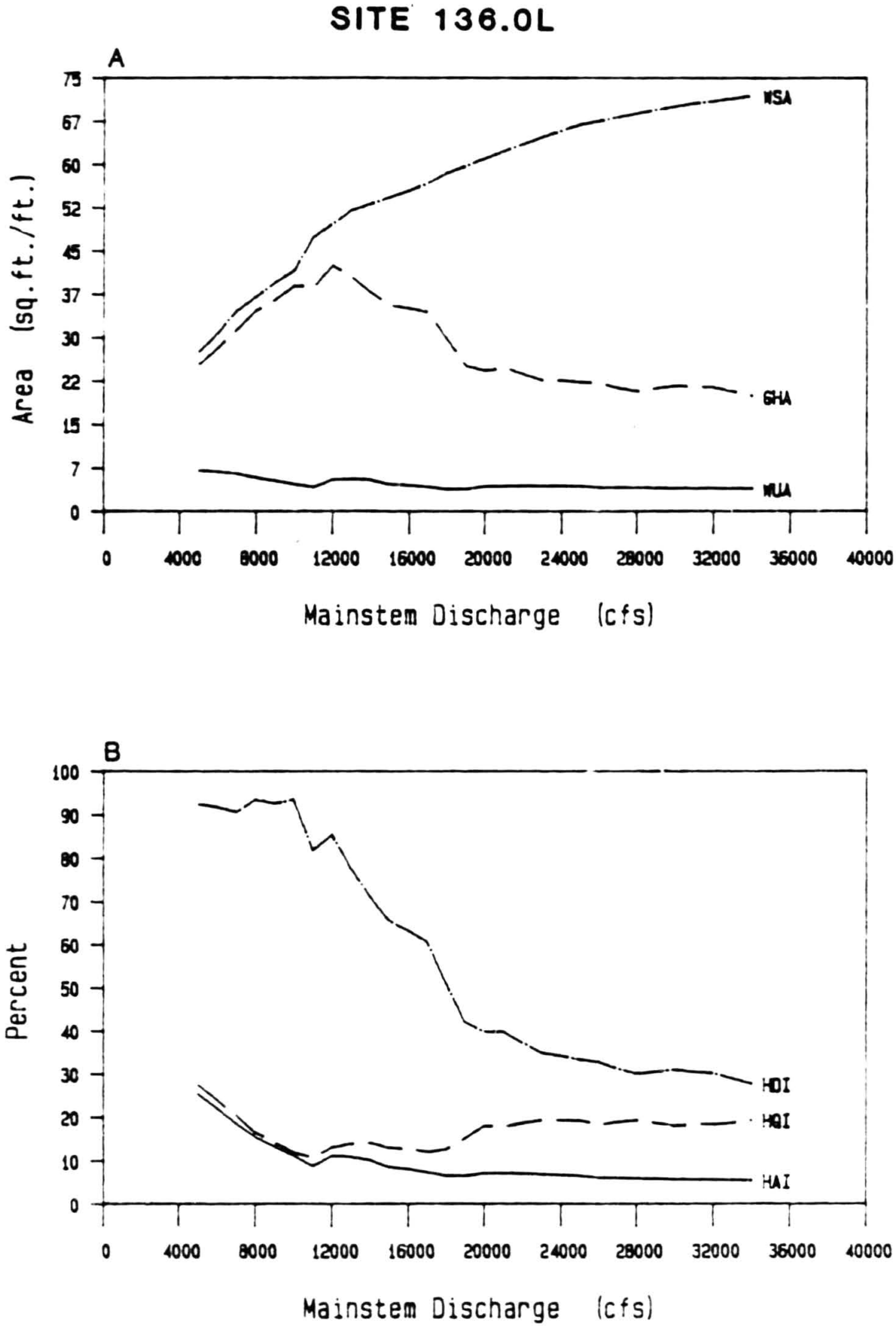


Figure 39. Surface area and chinook rearing habitat index response curves for modeling site 136.0L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

at lower than at higher flows; the rate of change in WSA per 1000 cfs increment in mainstem discharge declines perceptibly at flows exceeding 16,000 cfs. This response pattern is accentuated at sites with wide, shallow channel cross sections such as Site 131.7L (Plates A-17 and A-18, Figure 37).

In terms of juvenile chinook habitat potential, the most remarkable feature of Group IV modeling sites is the comparatively large amounts of WUA they provide at low to moderate mainstem flows. A comparison of the WUA values and, more appropriately, HAI functions (Figures 40 through 43) with estimates obtained for modeling sites from other Representative Groups suggests that Group IV specific areas provide a significant amount of rearing habitat within the middle river. This conclusion is supported by ADF&G sampling data indicating high utilization of these sites by juvenile chinook during the summer months (Dugan et al. 1984).

At all modeling sites except Site 131.7L, usable rearing habitat is greatest at the lowest evaluated flow (5,000 cfs), and after a gradual decline either continues to taper off or remains constant for flows above 16,000 cfs. Turbidity levels are high at all discharges and most areas of the sites possess suitable depths for rearing fish. Changes in WUA and HAI are therefore directly proportional to the increase or decrease in the availability of suitable velocities. As an example, Williams (1985) demonstrated that the total area within Site 112.6L possessing suitable rearing velocities is five times greater at 13,500 cfs than at 33,000 cfs.

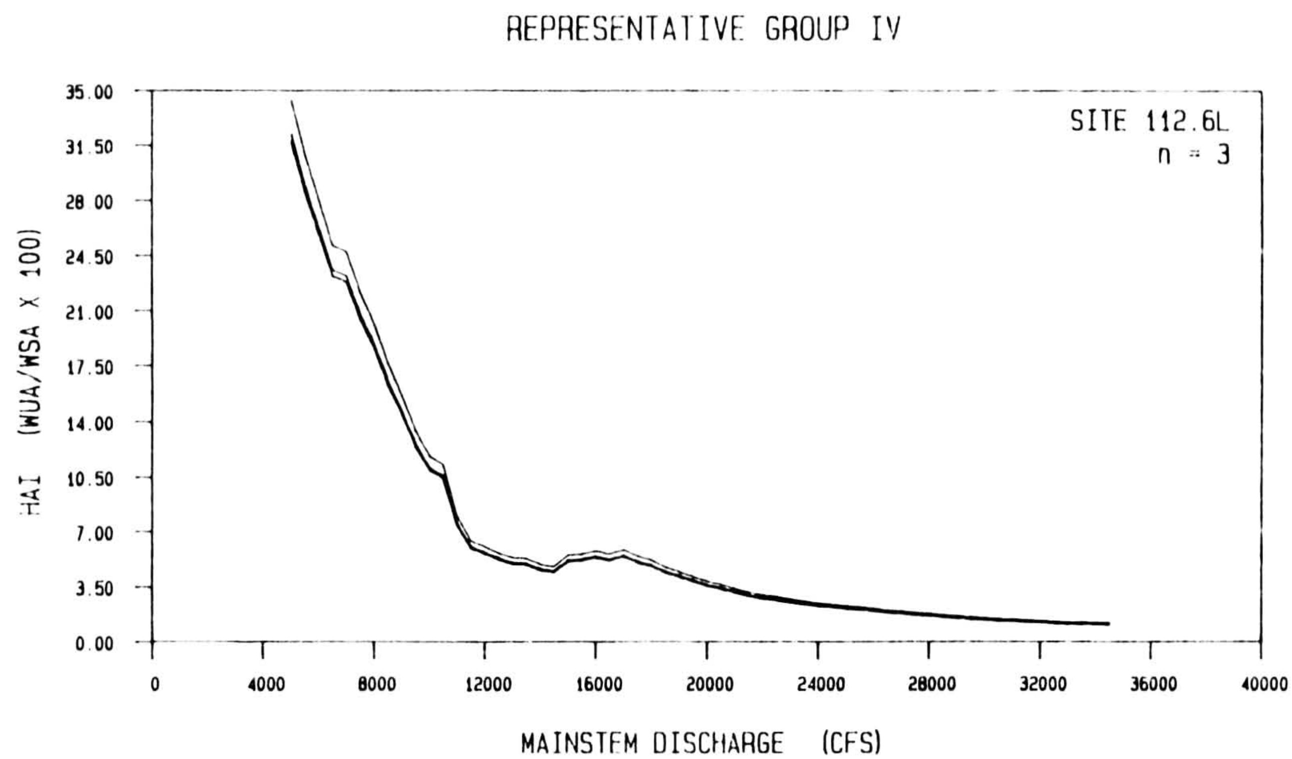


Figure 40. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 112.6L of Representative Group IV.

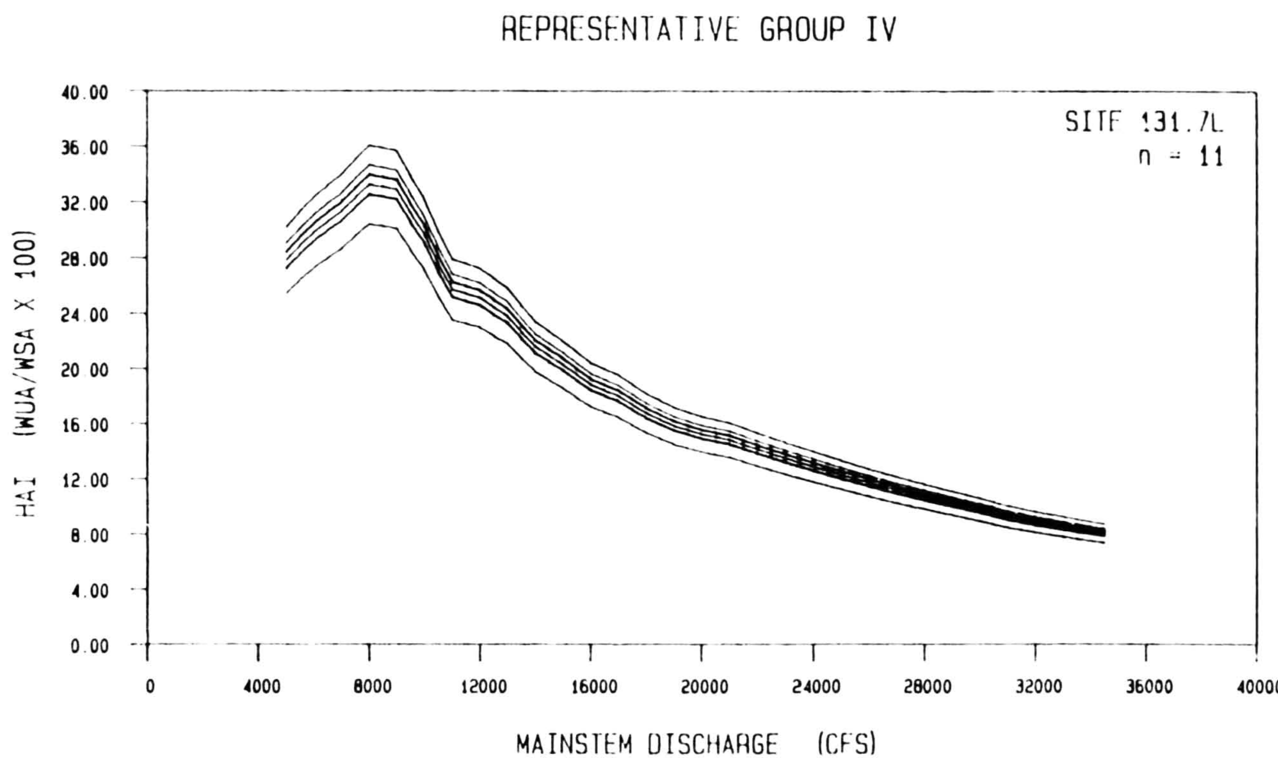


Figure 41. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 131.7L of Representative Group IV.

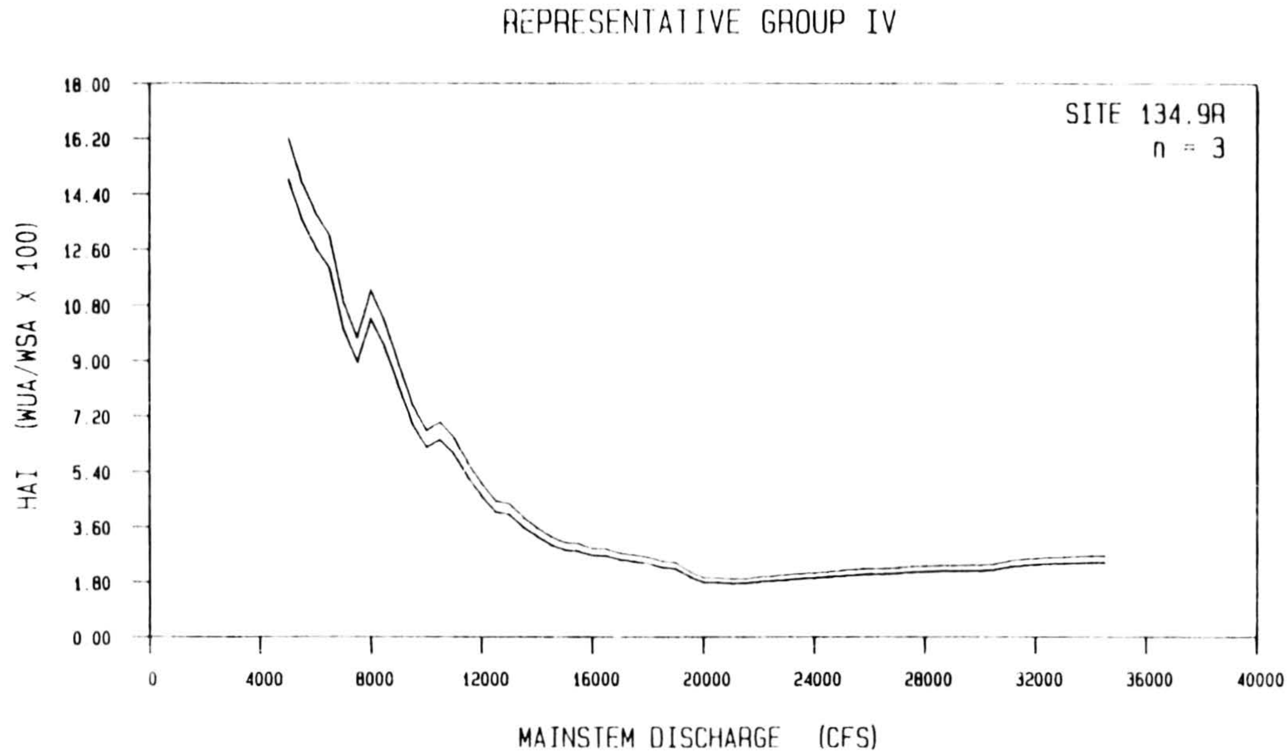


Figure 42. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 134.9R of Representative Group IV.

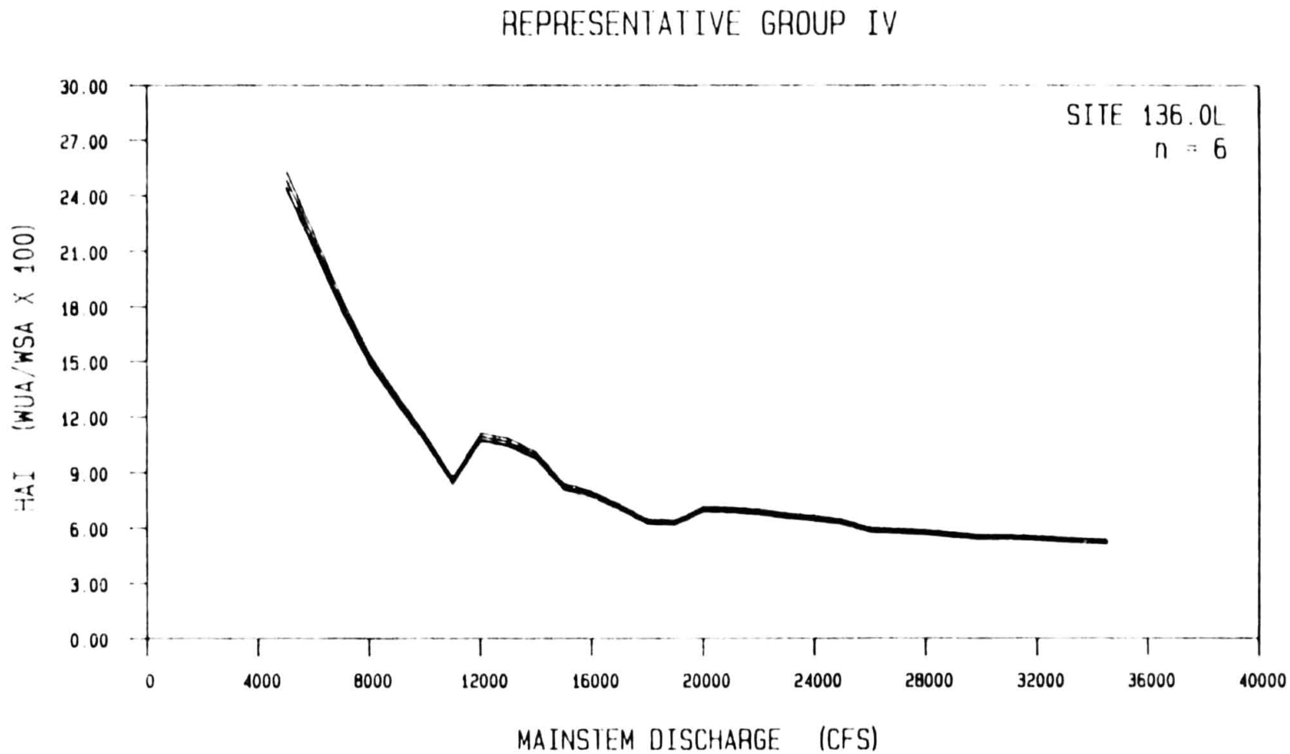


Figure 43. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 136.0L of Representative Group IV.

GHA and HDI curves reveal that the amount of gross habitat at the modeling sites is nearly equal to their total wetted surface area for flows ranging from 8,500 (Sites 112.6L and 134.9R) to 17,000 cfs (Site 131.7L). However, mean reach velocities measured at specific areas within this group averaged 3.3 fps at 10,000 cfs (Aaserude et al. 1985), well above the range of velocities tolerated by juvenile chinook salmon, suggesting that for the group as a whole, the amount and proportion of gross rearing habitat is probably greatest when flows are less than 10,000 cfs. Regardless of discharge levels, the quality and quantity of usable rearing habitat is greatest along the margins of the modeling sites due to the reduction of velocities in these areas.

The specific areas relegated to Representative Group IV have been divided among the four study sites on the basis of their structural habitat indices. Over half of the specific areas are grouped with Site 131.7L due to their poor structural habitat quality. Sites 136.0L and 134.9R were assigned 6 and 3 of the specific areas, respectively. The remaining 3 sites, all possessing SHI values of 0.59 or greater, were grouped with Site 112.6L. HAI response functions were derived for each specific area by normalizing the parent modeling site curves using breaching flow differences and SHI ratios. The derived HAI curves are shown in Figures 40 and 43. The strong resemblance between curves is related to their low breaching discharges and similar hydraulic geometry. The specific areas associated with Site 131.7L deviate slightly from the other sites in that rearing habitat availability peaks in the vicinity of 8,000 cfs rather than at streamflows of 5,000 cfs or less.

The aggregate WSA response for the group is shown in Figure 44. As discussed above, the proportion of the wetted surface area providing usable chinook habitat in Group IV sites, particularly in the lower flow range, is high in comparison to specific areas from other representative groups. This characteristic, when coupled with the fairly large surface areas associated with Group IV specific areas, results in exceptionally large rearing WUA forecasts for Representative Group IV as a whole (Figure 44). The significance of this fact will be discussed in Section 4.0 following presentation of aggregate WUA curves for all representative groups.

Juvenile chinook potential in Group IV sites is highest at mainstem discharges of 10,000 cfs and less. Peak rearing WUA values (approximately 4.1 million square feet) are attained at 8 - 8,500 cfs. This trend is related to the low breaching flows characteristic of specific areas within this group. The composite suitability of velocity and depth within these sites decreases rapidly as flows increase; WUA declines concomitantly, reaching a low of 1.6 million square feet at 35,000 cfs.

3.5 Representative Group V

This group includes shoal areas which transform into clear water side sloughs at lower mainstem discharges. A shoal is similar to a riffle in that both are topographic high points in the longitudinal bed profile of the river and are therefore zones of accretion. Shoals, however, are easily distinguished from riffles by their morphological features and the hydraulic processes responsible for their existence. As a general rule, shoals form immediately downstream of point gravel bars located at bends of

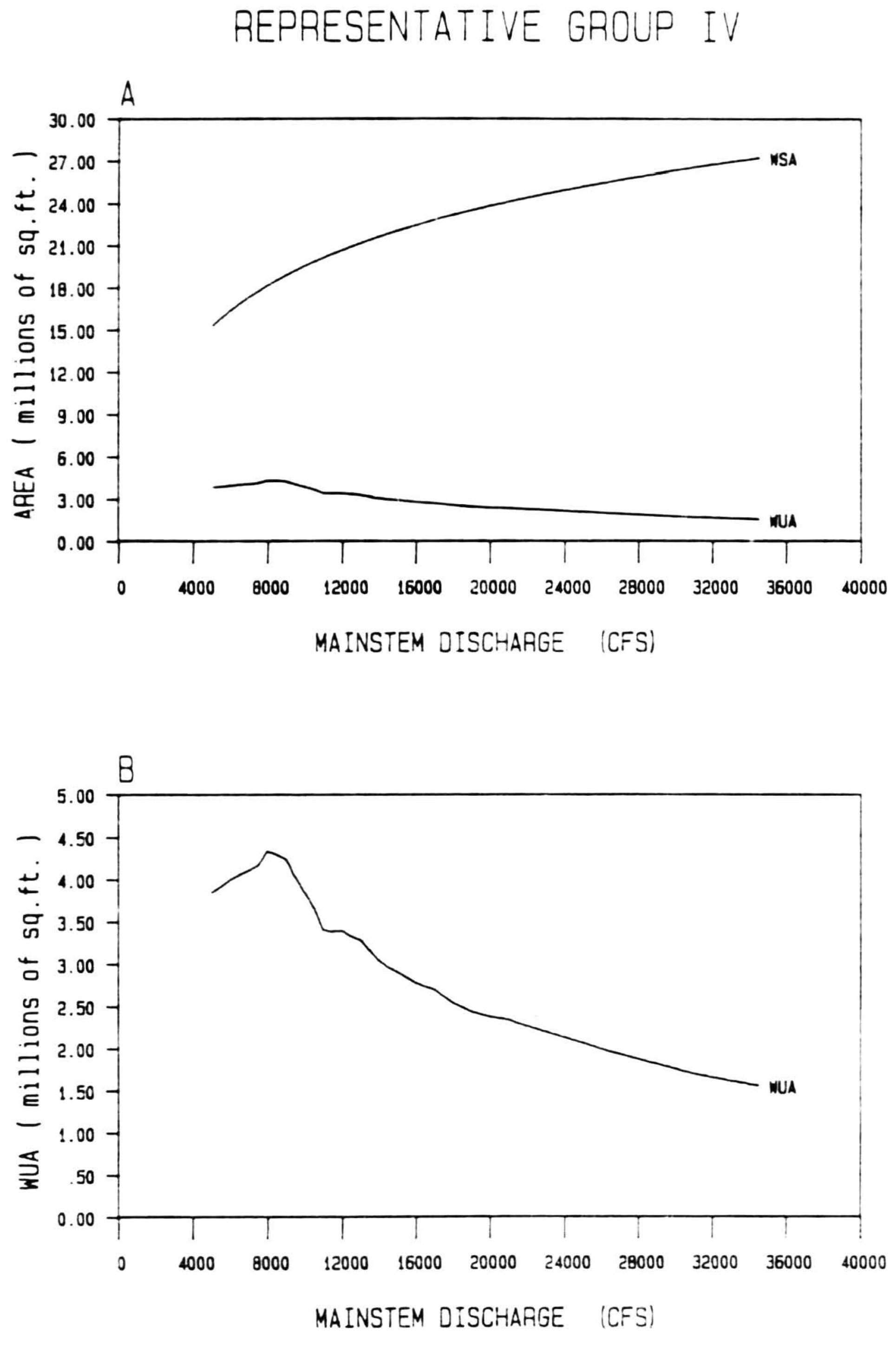


Figure 44. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group IV of the middle Susitna River.

the river or at the lower end of established islands. Due to reduced flow in these areas, shoals are characterized by fine sediments (sand and gravels) deposited on the falling stages of floods and at low flow. Larger substrates are possible if the shoal has stabilized and begun to take on gravel bar characteristics. Shoals naturally evolve into gravel bars or islands as erosion continues on the opposite (outer) bank.

Flow across shoal areas may be transverse to mainstem flow and velocities tend to be slower-than-average due to the drag effect exerted by the streambed. As water levels drop, flow is concentrated in a few small channels which feed a larger single channel on the inside of the shoal. When feeder channels dewater at lower discharges there is usually sufficient mainstem downwelling through the head and sides of the channel berm to maintain a small amount of clear water slough habitat at the site.

The general morphologic features described above may be observed in aerial photographs (Plate A-23) of Site 141.6R--the only modeling site found in Representative Group V. Site 141.6R begins to convey mainstem water at 18,000 cfs but is not controlled by mainstem discharge until 22,000 cfs. Site flows under non-breached conditions average 5 cfs. Wetted surface area and juvenile chinook weighted usable area at Site 141.6R are assumed to remain constant in the non-breached state; the ratio of WUA to WSA, expressed as a percentage, is 13.4 percent (Figure 45). Gross habitat area is estimated to comprise 83 percent of the total surface area when clear water conditions prevail.

As is common with most side sloughs of the middle Susitna River, the introduction of turbid mainstem water has an immediate effect on the

SITE 141.6R

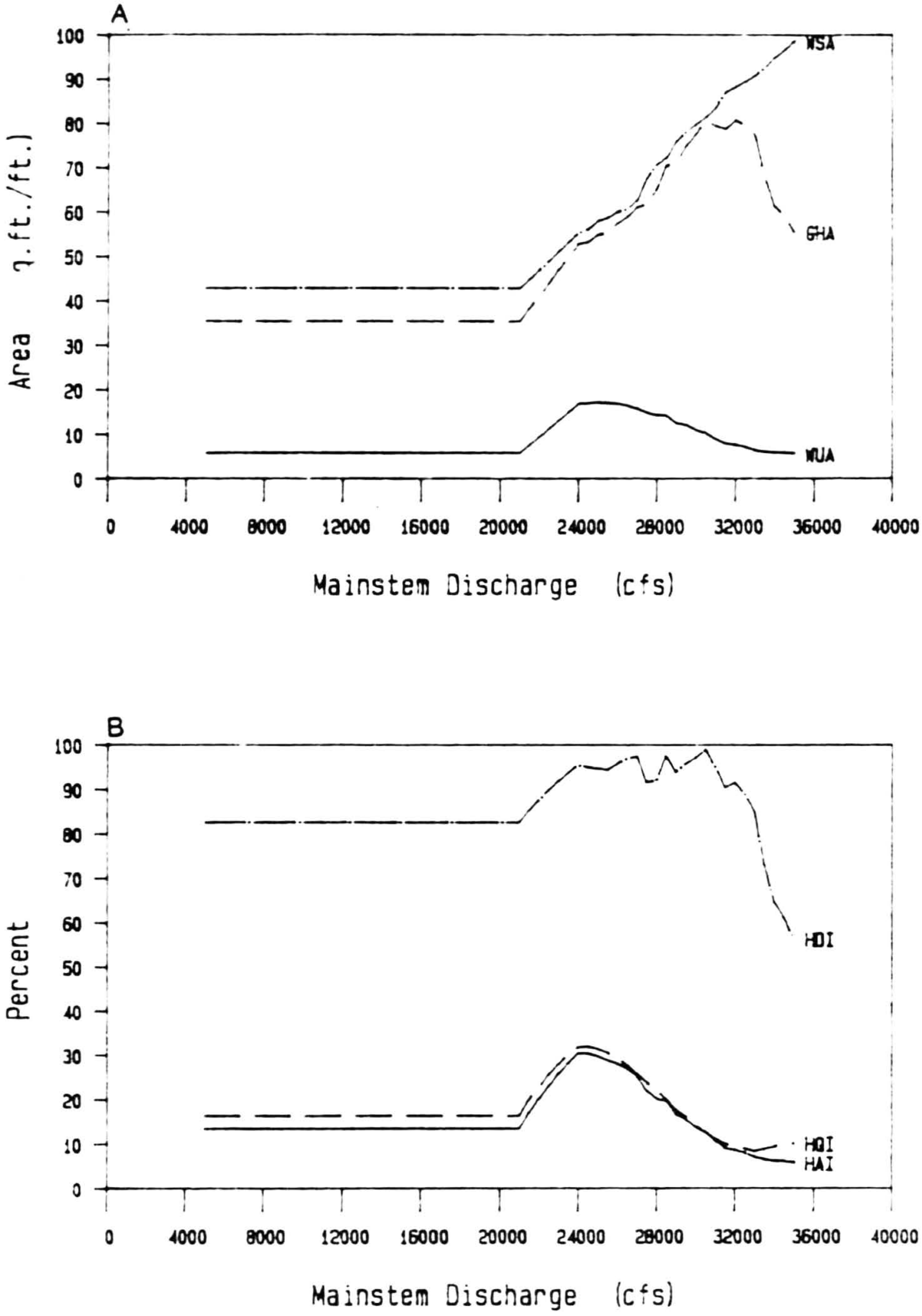


Figure 45. Surface area and chinook rearing habitat index response curves for modeling site 141.6R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

usability of Site 141.6R by juvenile chinook. Other than turbidity, the most significant factor contributing to the sharp rise in usable habitat is the large increase in wetted surface area. Most of the recruited habitat is shallow and slow velocity areas that may be used to some extent by young chinook. Figure 45 indicates that over 90 percent of the total surface area has at least some rearing habitat value at discharges between 23,000 and 32,000 cfs. Maximum WUA, HAI, and HQI values occur at the lower end of this flow range; each of these habitat indices peak in the range of 24,000 and 25,500 cfs. Habitat index curves are drawn out at their upper ends by the gradual loss of suitable velocity areas. Eventually, flow over the shoals is fast enough to significantly reduce the availability and quality of chinook rearing habitat at the site.

There are 9 specific areas within Representative Group V. The areas breach over a wide range of mainstem discharges (<5,000 to 23,000 cfs) and exhibit large variations in structural habitat quality. The HAI function obtained for Site 141.6R, which breaches at 22,000 cfs and has a comparatively high SHI value, was used as a template for deriving HAI curves for all specific areas within the group (Figure 46 and Appendix B). There does not appear to be any correlation between the magnitude of breaching flow and structural habitat quality of peak habitat availability for these specific areas.

Collectively, the specific areas which make up Representative Group V do not provide significant amounts of juvenile chinook habitat, even under ideal flow conditions. The low aggregate WUA values portrayed in Figure 47 result from 1) the small number of specific areas assigned to Group V, and 2) the small amount of total wetted surface area associated

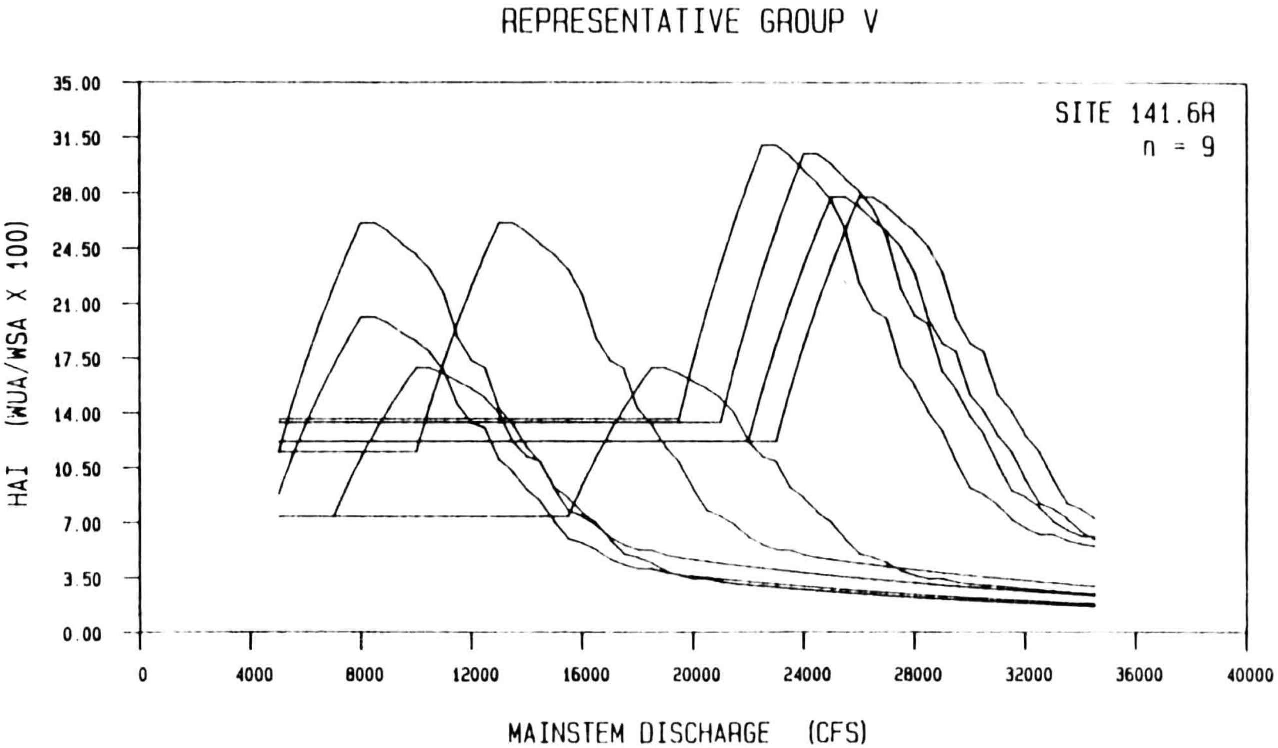


Figure 46. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 141.6R of Representative Group V.

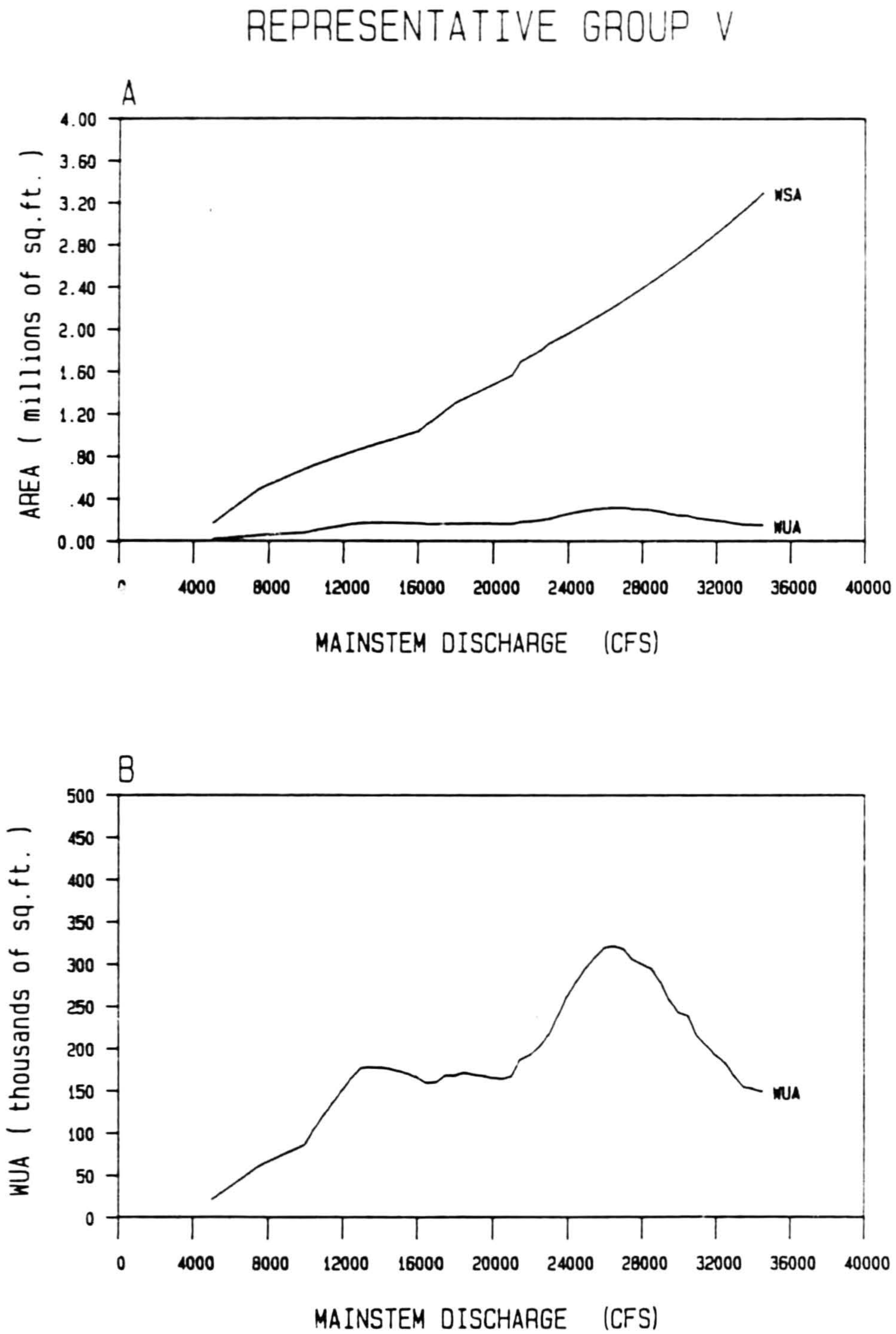


Figure 47. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group V of the middle Susitna River.

with these sites. Overall, less than 0.4 million square feet of rearing WUA is provided by Representative Group V by streamflows within the range of 5,000 to 35,000 cfs. WUA values peak at approximately 26,000 cfs when joint surface area and HAI values are maximized (Figure 47).

3.6 Representative Group VI

The specific areas within this group are products of the channel braiding processes active in the high gradient middle segment of the Susitna River. Included are overflow channels which parallel the adjacent mainstem. Typically separated from the mainstem by a sparsely vegetated bar, these channels may or may not possess upwelling. These specific areas may represent more advanced stages of shoal development in which their gravel bars have stabilized due to the growth of vegetation and further high-stage sedimentation, and mainstem overflow is usually delivered by a single dominant feeder channel. Incision of the lateral channels has gradually occurred over time, leading to lower head berm elevations and coarser substrates. Side channel gradients are usually greater than adjacent mainstem channels as a result of hydraulic processes which adjust channel morphology to maintain transport continuity. The spectrum of shoal-to-side channel developmental stages represented by the specific areas of Group VI is indicated by the wide range of breaching discharges and structural habitat indices recorded by Aaserude et al. (1985).

Included in Representative Group VI are modeling sites 133.8L and 136.3R, which breach at 17,500 and 13,000 cfs, respectively, but remain watered at non-breached mainstem discharges. Plates A-24 through A-26 (Appendix A) give some idea of the morphologic features and wetted surface area response to flow of Group VI modeling sites. A large backwater occurs at their confluence with the mainstem channel. The gravel bar at Site 136.3R appears to be more stable than the bar at Site 133.8L, judging from differences in the type and amount of vegetation cover. Both modeling sites are relatively flat in cross section except for deep narrow channels running along banks opposite the gravel bars. These banks are steep-walled whereas banks formed by the gravel bars are gently sloping. These features are largely responsible for the type of response of juvenile chinook habitat to changes in mainstem discharge observed at the two Group VI modeling sites.

Habitat index and surface area response functions derived for Site 133.8L and 136.3R are conspicuously similar, particularly if allowance is made for differences in mean channel width (Figures 48 and 49). In both cases, the anticipated increase in WUA following breaching occurs, but after attaining moderate levels the amount of rearing habitat remains fairly constant at higher mainstem discharges. This pattern, which is uncharacteristic of more developed side channels (compare, for example, the WUA response curves for sites from Representative Group VI with results for Group III and IV modeling sites), is also apparent in the relationship between gross habitat area and river discharge. The constancy of WUA and GHA values at moderate-to-high mainstem flows results in generally stable habitat quality at the sites, implying that areas suitable for chinook rearing are recruited and lost at comparable rates. Regardless of flow levels, most juvenile chinook habitat at Sites 133.8L and 136.3R is associated with the gravel bar shoreline and backwater area of both sites.

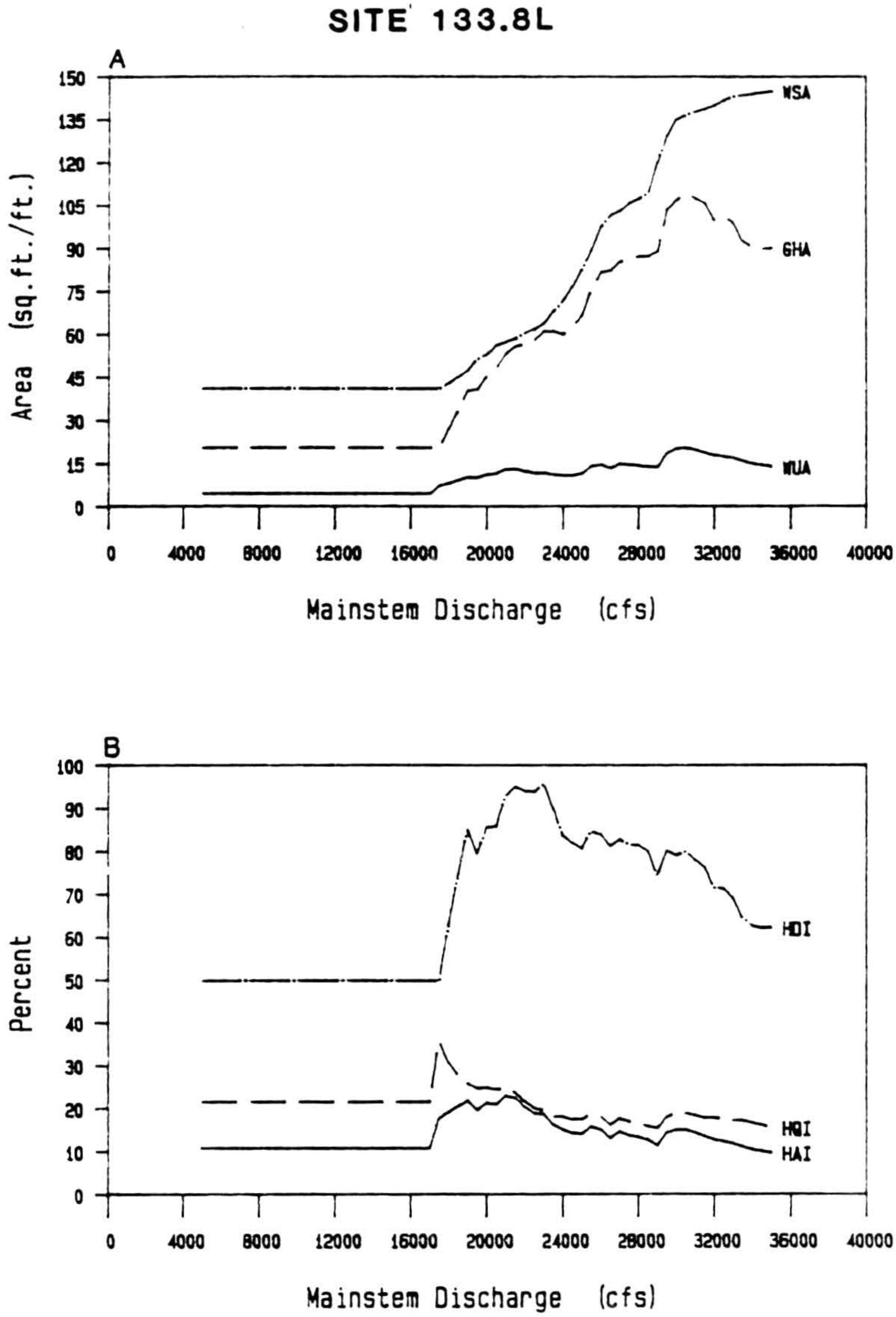


Figure 48. Surface area and chinook rearing habitat index response curves for modeling site 133.8L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

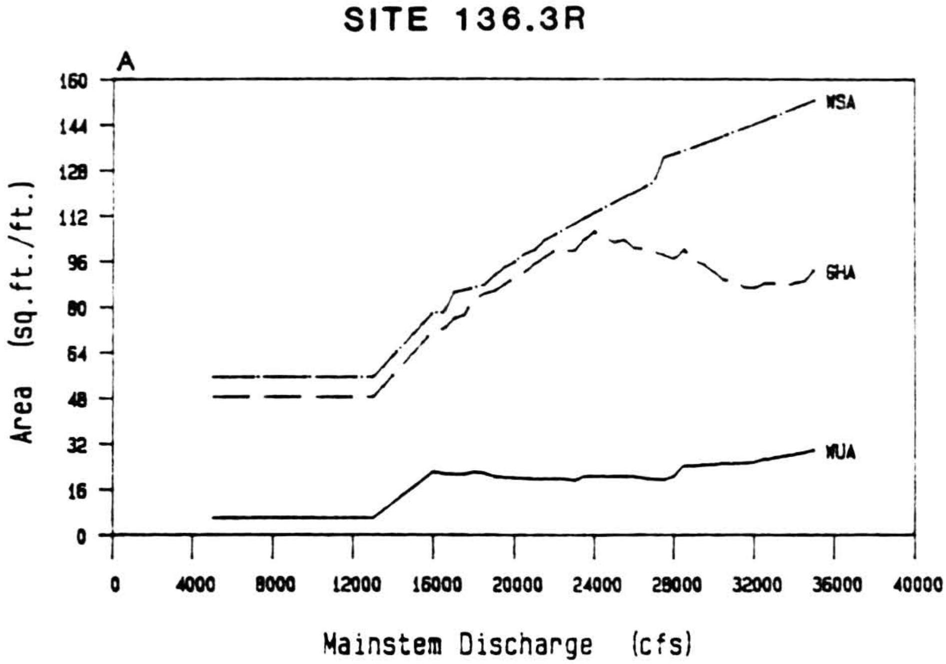


Figure 49. Surface area and chinook rearing habitat index response curves for modeling site 136.3R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

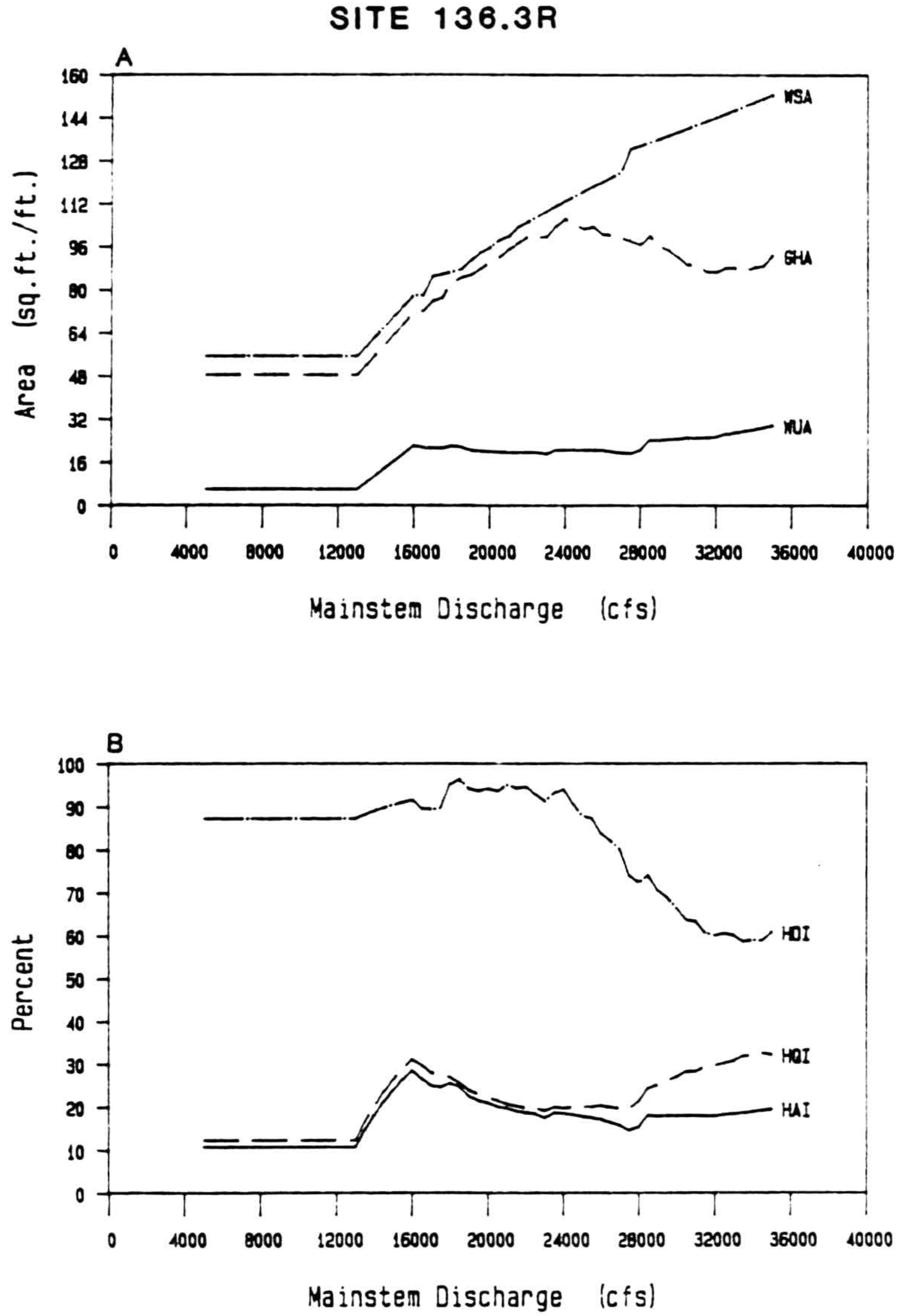


Figure 49. Surface area and chinook rearing habitat index response curves for modeling site 136.3R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

HAI functions developed for the two modeling sites exhibit the expected rise and fall in juvenile chinook habitat availability which attends breaching and further increases in discharge. However, because WUA values remain constant at higher flows, the slope of the descending limb of the HAI curves is not as great as observed for other representative groups. Based on an assessment of structural habitat data obtained at modeled and non-modeled specific areas in Group VI, exactly half of the 14 specific areas may be grouped with Site 133.8L and Site 136.3R, respectively. HAI functions derived from the modeling sites are presented for each subgroup in Figures 50 and 51 and Appendix B. Note the relatively narrow range of breaching flows and high SHI values (see also Table 4) of specific areas associated with Site 136.3R as compared with areas represented by Site 133.8L.

Due to their relatively high breaching flows and rapid wetted surface area response following breaching (Figure 52), specific areas within Representative Group VI provide considerably more juvenile chinook WUA at high as compared to low mainstem discharges. Figure 52 indicates the aggregate rearing WUA function derived as the sum of individual specific area habitat values for flows ranging from 5,000 to 35,000 cfs. Rearing habitat potential increases steadily as a function of flow throughout this range. The amount of juvenile chinook WUA forecast for 35,000 cfs (1.3 million square feet) represents over 30 times the amount of WUA forecast for 5,000 cfs (0.04 million square feet). The correlation between wetted surface area and aggregate rearing WUA values is more pronounced in Group VI than in other representative groups due to the relative constancy of HAI values across all flows.

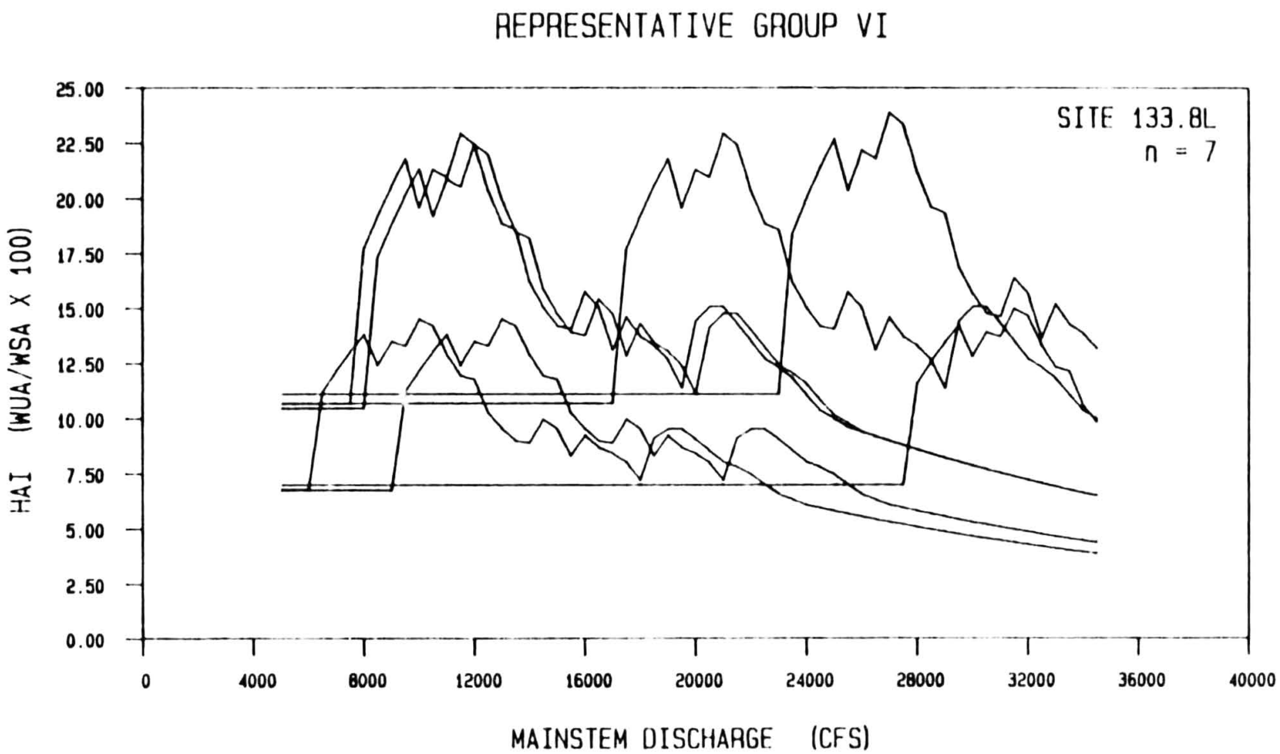


Figure 50. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 133.8L of Representative Group VI.

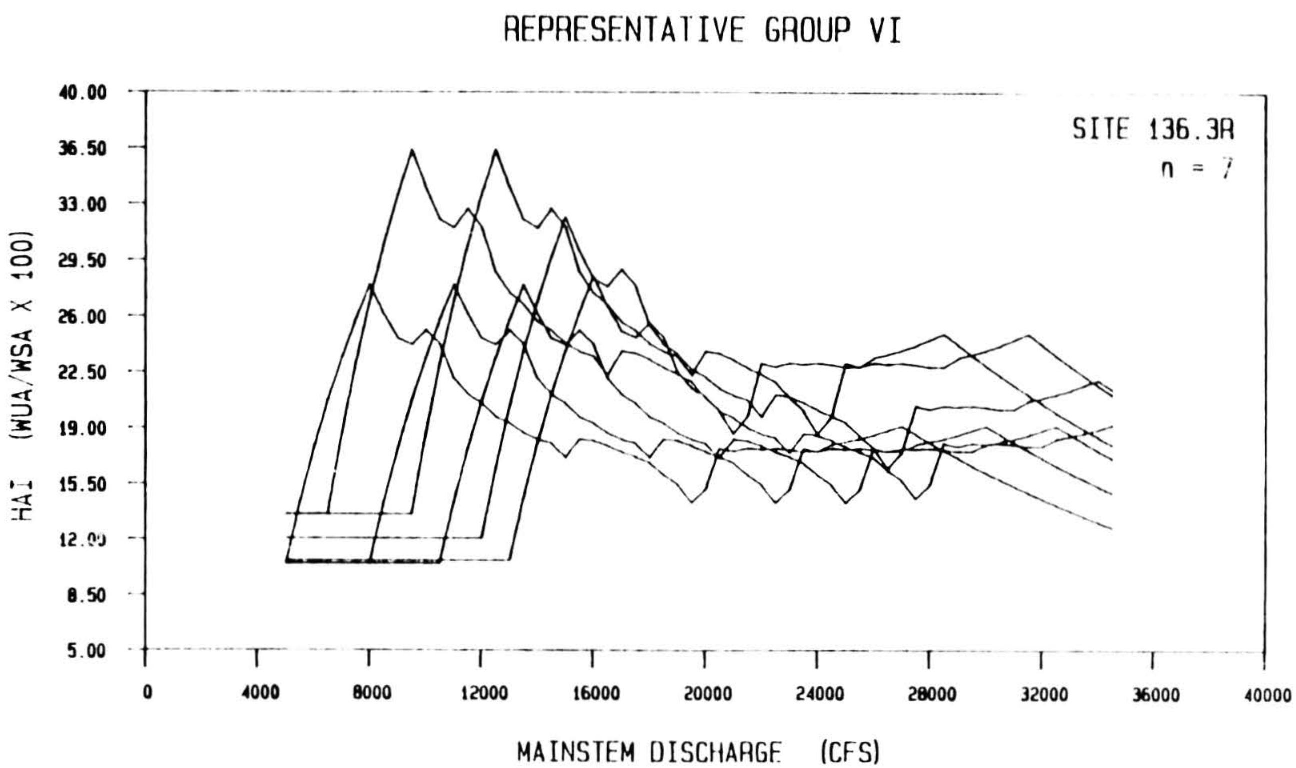


Figure 51. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 136.3R of Representative Group VI.

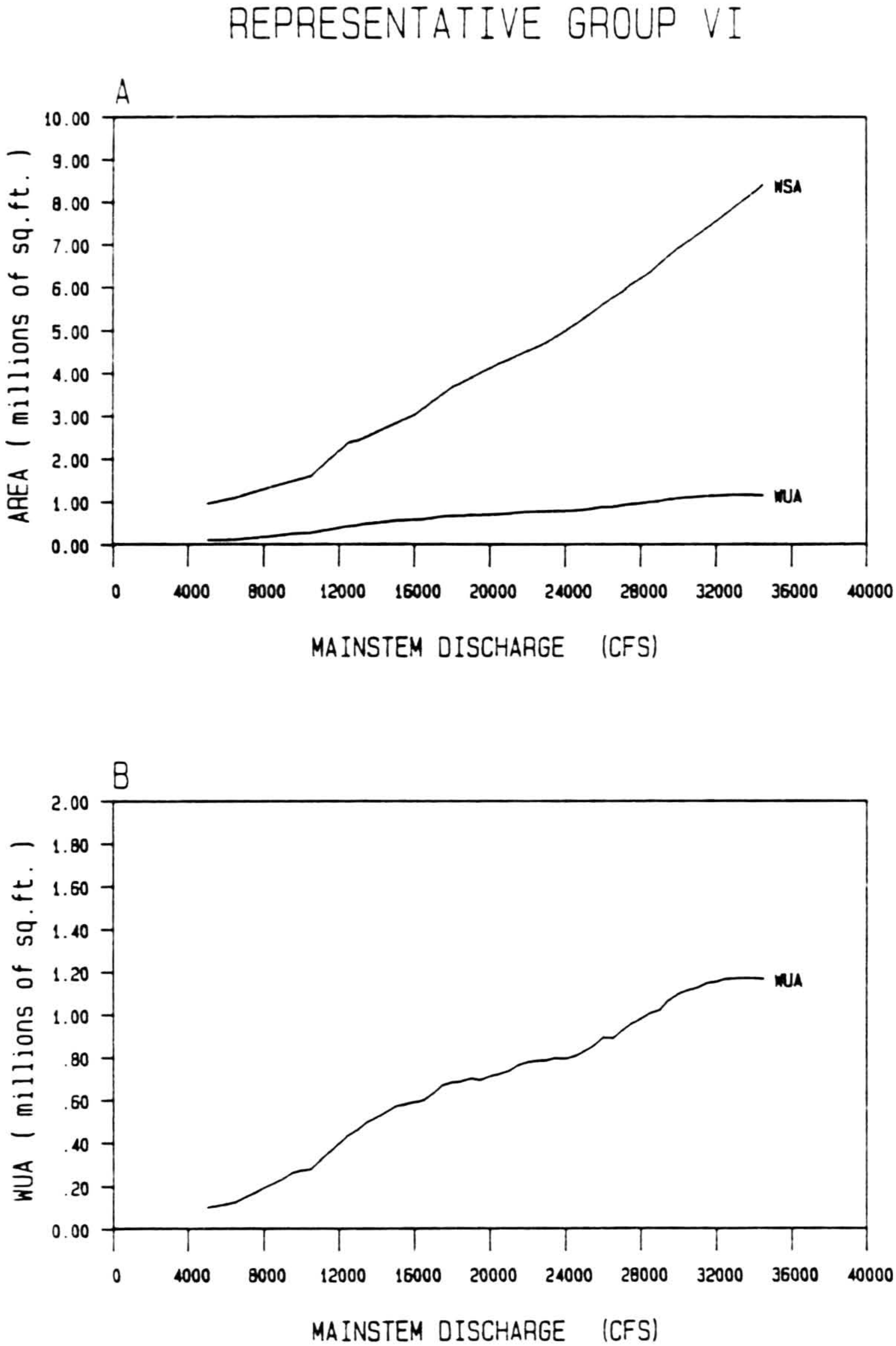


Figure 52. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group VI of the middle Susitna River.

3.7 Representative Group VII

This group is dominated by side channels possesing low breaching discharges and organized into distinctive riffle/pool flow patterns. In most cases, the specific areas are comparatively short with small length:width ratios and are composed of a single riffle extending from the head of the site down to a large backwater area at the mouth. The transition from riffle to backwater pool is defined by an abrupt step in bed and water surface profile. Head berms are generally broad-crested and the riffles of greater-than-average slope. The increase in water velocities resulting from steep riffle gradients and an increase in streamflow tends to counteract the staging effect of rising mainstem flows at the mouth of the site. Consequently, the rate of change in backwater area is less than is observed at lower gradient sloughs and side channels over a comparable range of discharges. Backwater area varies at Group VII sites primarily by expanding or contracting laterally as flows change. Flow characteristics within backwater pools include near zero velocities and a calm surface, as compared to the broken and rapidly moving water of riffles.

Considerable longitudinal variation in streambed texture occurs in Group VII specific areas. Riffles are composed of rubble and boulder size substrates, whereas backwater areas tend to have sandy beds. Periodic high flows may temporarily expose coarse sediment in backwater pools which is subsequently covered by sand and silt during periods of low flow. High turbidities also prevail at these sites since upwelling is not present.

Modeling Site 119.2R is the sole representative of the 7 specific areas classified within Group VII. This site possesses the typical riffle/pool sequence characteristics just described (Plates A-27 and A-28 in Appendix A). As indicted in Figure 53, a basal level of wetted surface area and juvenile chinook WUA is maintained under non-breached conditions by backwater effects. Peak rearing habitat potential occurs shortly after the berm at the head of the site is overtopped and the riffle area is inundated. The relatively broad width and uniform elevation of the head berm strongly influences the distribution and amount of juvenile chinook habitat at Site 119.2R. Areas of usable habitat within the riffle rapidly expand until local velocities begin to exceed tolerable limits which in turn prompts a decline in rearing habitat. Maximum WUA values are forecast for discharges of 12,500 to 13,000 cfs, when juvenile chinook WUA is nearly four times greater than WUA present under non-breached conditions (39,300 versus 10,500 sq.ft./ft.).

Gross habitat is widely distributed throughout Site 119.2R at flows ranging up to 17,000 cfs, as demonstrated by the GHA response to discharge in Figure 53. However, habitat availability and quality, as indexed by HAI and HQI values, begins to diminish appreciably around 12,000 cfs. Peak HAI and HQI estimates were similar at 40 percent, a fairly high value in comparison to other modeling sites. The minimum HAI value was 3 percent at 35,000 cfs. This HAI value was estimated by extending the WSA and WUA curves by eye for discharges exceeding 20,000 cfs (Hilliard et al. 1985). The HQI curve was not extrapolated past 20,000 cfs, but HQI values may be expected to be higher than HAI values to a degree which is proportional to the difference between gross habitat area and wetted surface areas at high discharges.

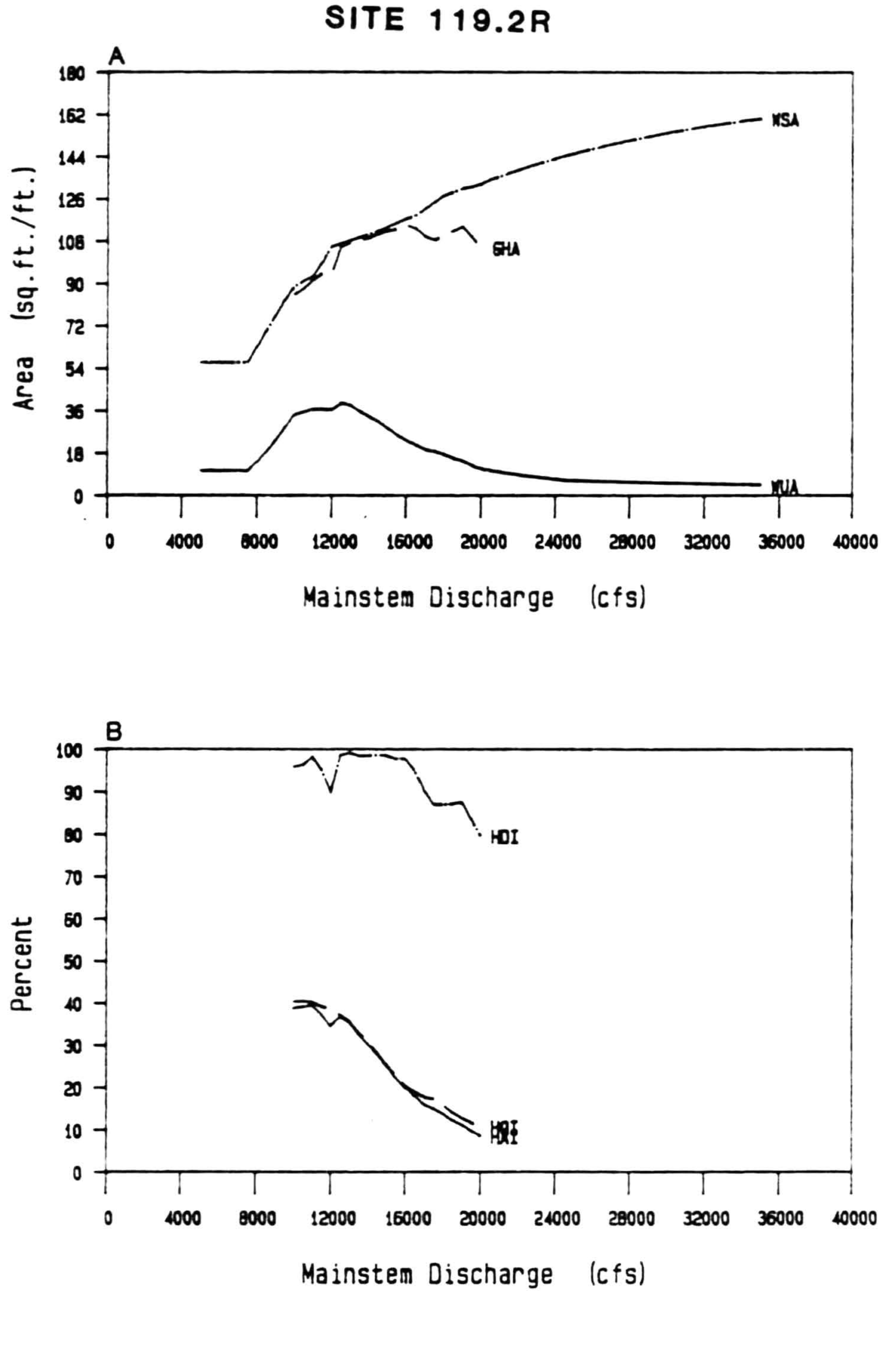


Figure 53. Surface area and chinook rearing habitat index response curves for modeling site 119.2R.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

HAI functions derived from modeling results for Site 119.2R display the low breaching flows and comparatively large habitat potential at low discharges associated with specific areas of Representative Group VII (Figure 54 and Appendix B). Within a narrow range of low mainstem discharges (10,000 to 13,000 cfs), HAI values compare favorably with peak HAI values recorded for specific areas from other groups. The marked decline in habitat availability at higher flows and the overall poor structural habitat quality (i.e., low SHI values) of Group VII sites suggests that hydraulic geometry plays a more important role than does object cover in determining the collective rearing habitat potential of this group.

As was the case for side channels comprising Representative Group IV, which are characterized by similarly low breaching discharges, the seven specific areas of Group VII provide notably greater amounts of usable rearing habitat at low than at high mainstem flows, as evidenced by the aggregate WUA function in Figure 55. This results from the comparatively high HAI values which occur immediately subsequent to breaching and their rapid decline at higher flows. Juvenile chinook WUA peaks at 0.3 million square feet at 8,000 cfs, remains at this level through 13,000 cfs and declines to 0.08 million square feet at 35,000 cfs.

3.8 Representative Group VIII

This group is comprised of 22 specific areas which tend to dewater at intermediate to high mainstem discharges. The absence of an upwelling groundwater supply may be due to the local structural geology and the location of the channels relative to sources of subsurface flow. Aaserude et al. (1985) noted that the heads of channels included in Group VIII were

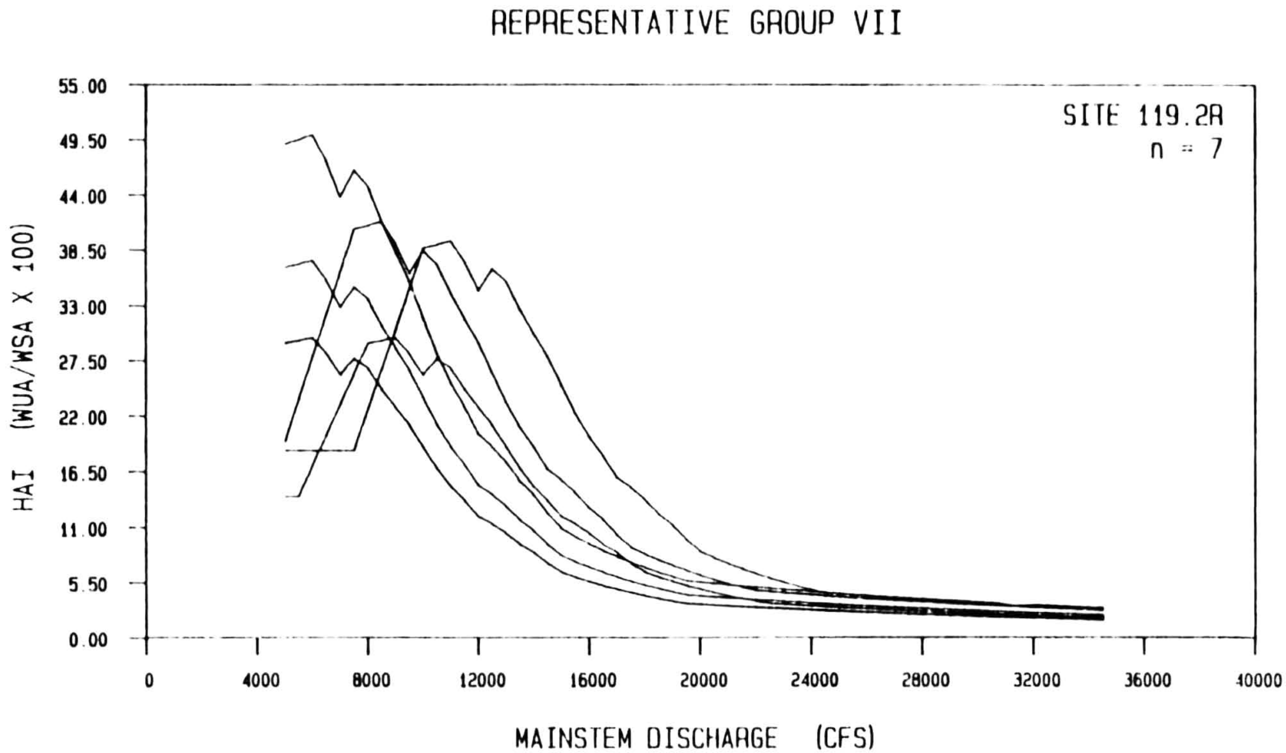
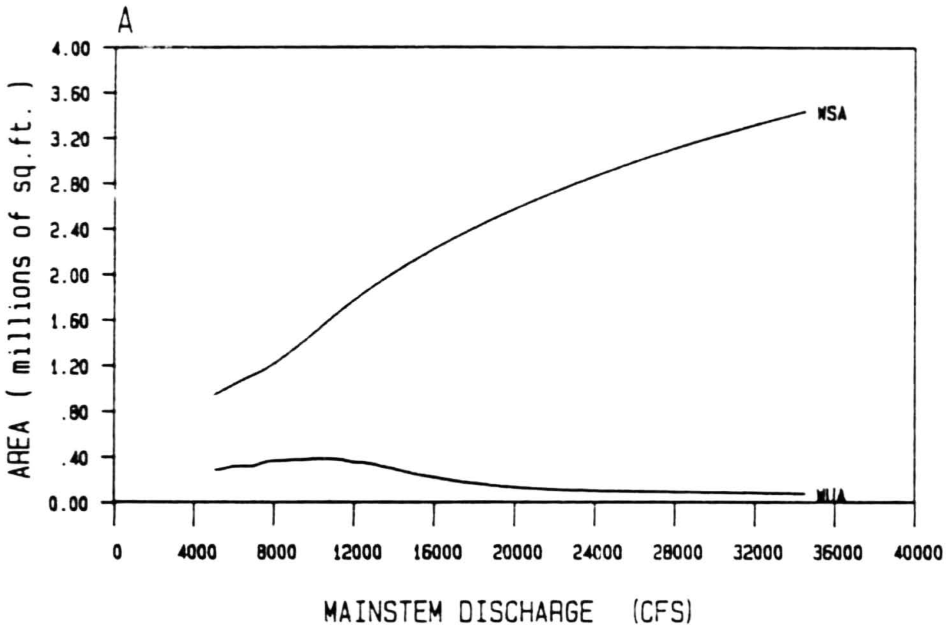


Figure 54. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 119.2R of Representative Group VII.

REPRESENTATIVE GROUP VII



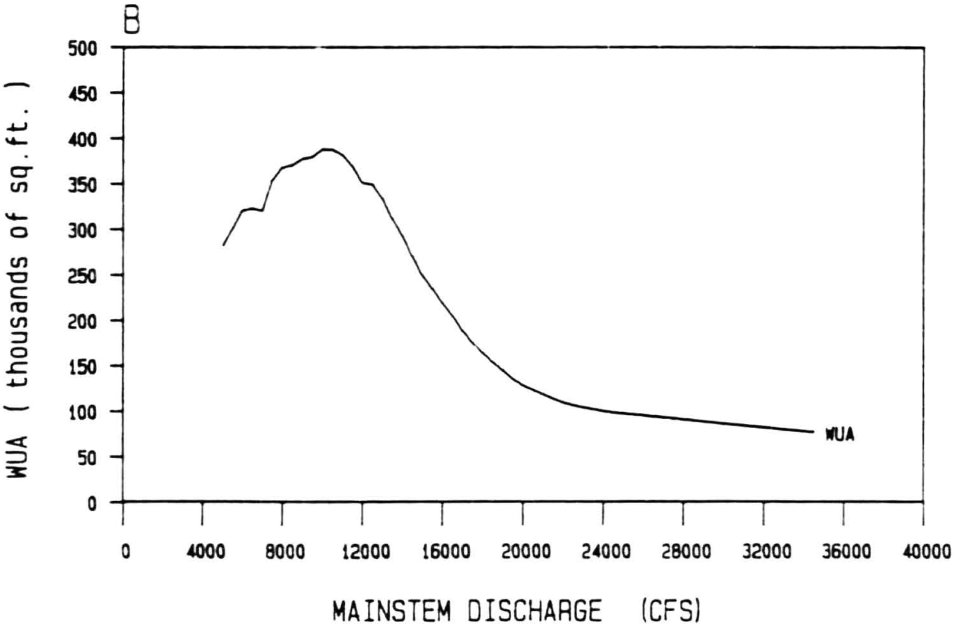


Figure 55. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group VII of the middle Susitna River.

frequently oriented at a 30^{o}+ angle to the adjacent mainstem channel. Apparently groundwater flow is either diverted away from these sites or occurs at a lower elevation than the bed elevation of the exposed channels.

In spite of their tendency to dewater, specific areas in Group VIII are similar to specific areas assigned to Groups II and III in their hydrologic, hydraulic, and morphologic properties. Therefore, because Group VIII does not possess a specific area with a rearing habitat modeling site, HAI functions based on modeling sites from Representative Groups II and III were used to represent Group VIII in the habitat extrapolation process. An obvious requirement was that the habitat functions for modeling sites selected to represent this group be modified to reflect the total loss of rearing habitat as mainstem stage declines below head berm elevations. Candidate modeling sites include Site 144.4L from Group II and Site 132.6L from Group III. The first modeling site is recommended by its high breaching discharge, its morphological similitude with several Group VIII specific areas, and by the general shape of its habitat response curves. Figure 29 illustrates the WSA, WUA and HAI curves which have been derived from Site 144.4L to represent a subclass of Group VIII specific areas. Note that the lefthand limb of the curves have been truncated at a breaching flow of 21,000 cfs.

Site 132.6L has been selected to represent the subclass of specific areas from Group VIII which dewater at intermediate discharges. Based on an examination of aerial photography obtained at several mainstem flows, these specific areas and Site 132.6L possess similar longitudinal and cross sectional profiles. Site 132.6L, which breaches at 10,500 cfs, eventually dewaters at 6,000 cfs as the water surface elevation drops below the elevation of the groundwater table. However, the revised modeling site habitat response curves have been truncated at 10,500 cfs to accurately reflect the rapid dewatering which occurs at Group VIII specific areas.

HAI curves derived from the modified HAI functions of Sites 144.4L and 132.6L are presented in Figures 56 and 57 and aggregate WSA response in Figure 58. The specific areas from Group VIII were divided between the modeling sites on the basis of breaching flow; the 9 specific areas which breach at 15,500 cfs and less are associated with Site 132.6L, and the remaining 11 sites are represented by Site 144.4L.

Since all of the specific areas associated with Group VIII are dewatered by 8,000 cfs, juvenile chinook habitat does not exist at flows below this value. This is reflected in the aggregate rearing WUA curve developed for Group VIII (Figure 58). WUA accumulates rapidly as the specific areas become breached and peak values (0.7 million square feet) are attained at 29,500 cfs. Rearing habitat potential declines slightly at higher flows.

3.9 Representative Group IX

This group contains specific areas categorized as mainstem, side channel, or shoal habitat with mean reach velocities greater than 5 fps at 10,000 cfs. These sites are closely associated with the main river corridor, usually convey a significant percentage of the total discharge, and possess small length to width ratios. Flow tends to parallel the overall channel direction but may not be distributed uniformly across the channel

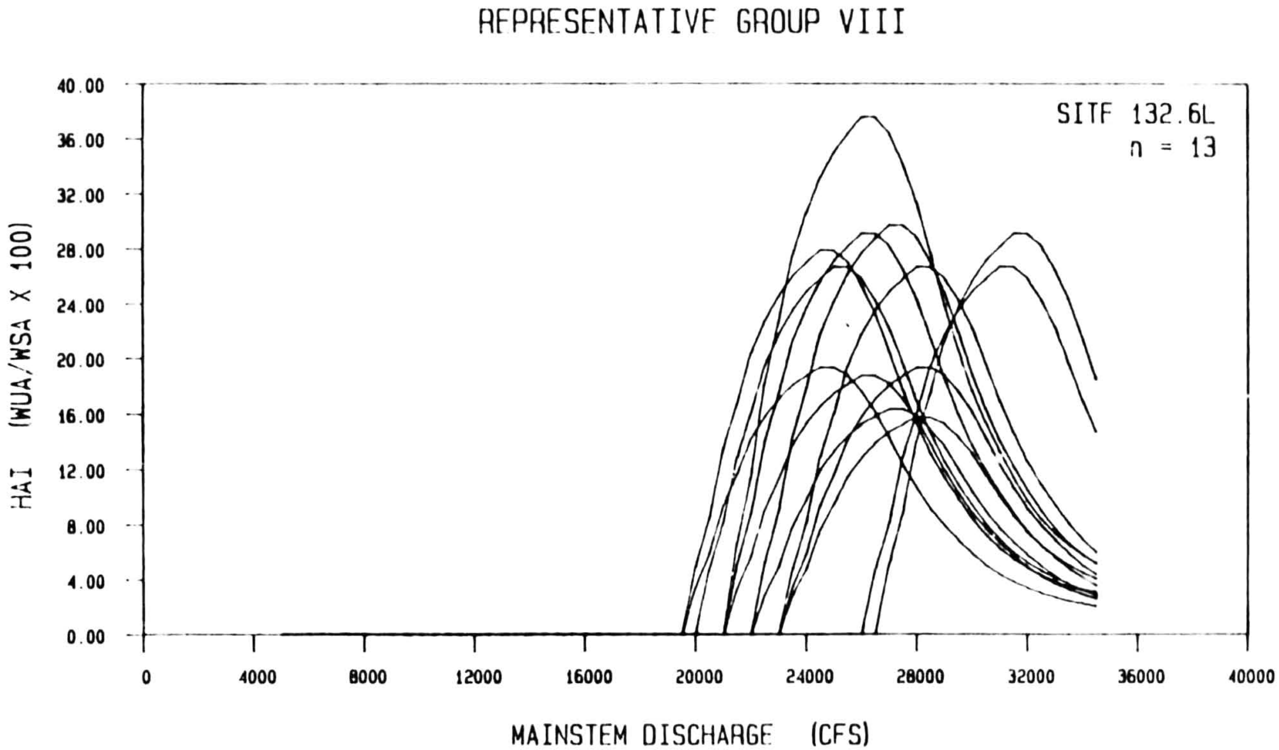


Figure 56. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 132.6L of Representative Group VIII.

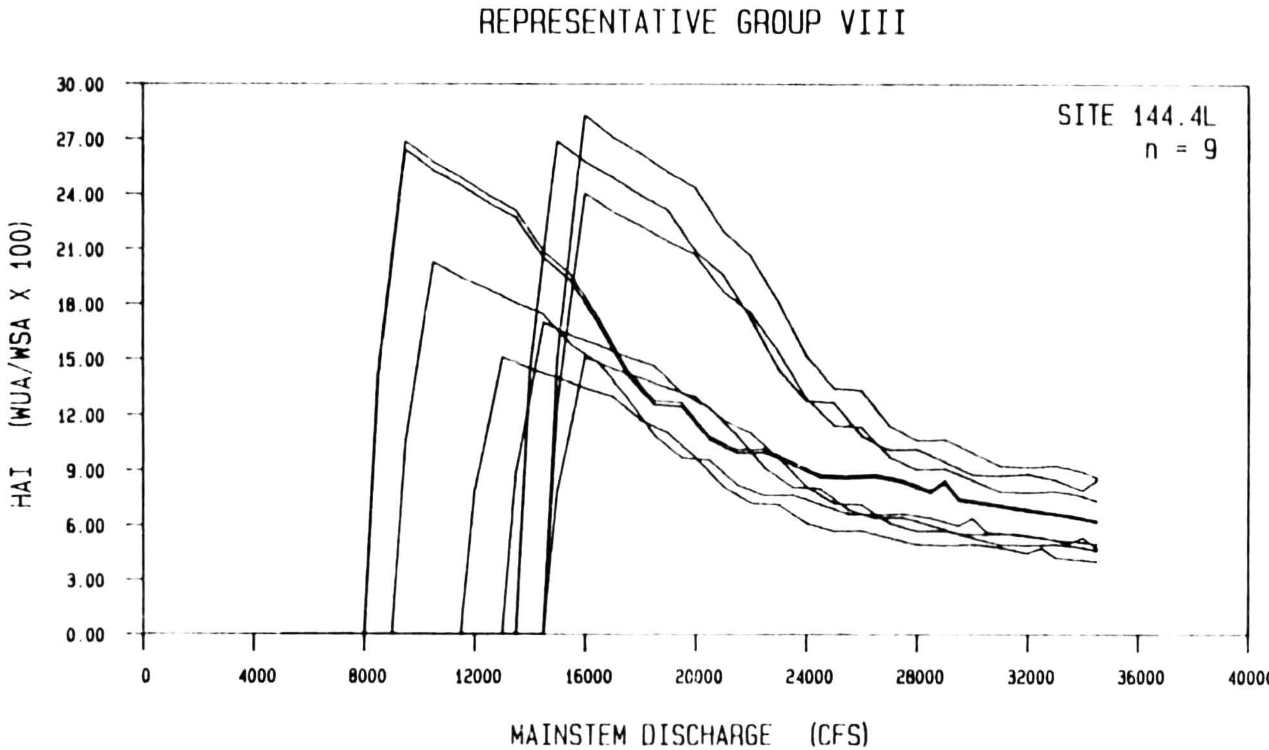


Figure 57. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 144.4L of Representative Group VIII.

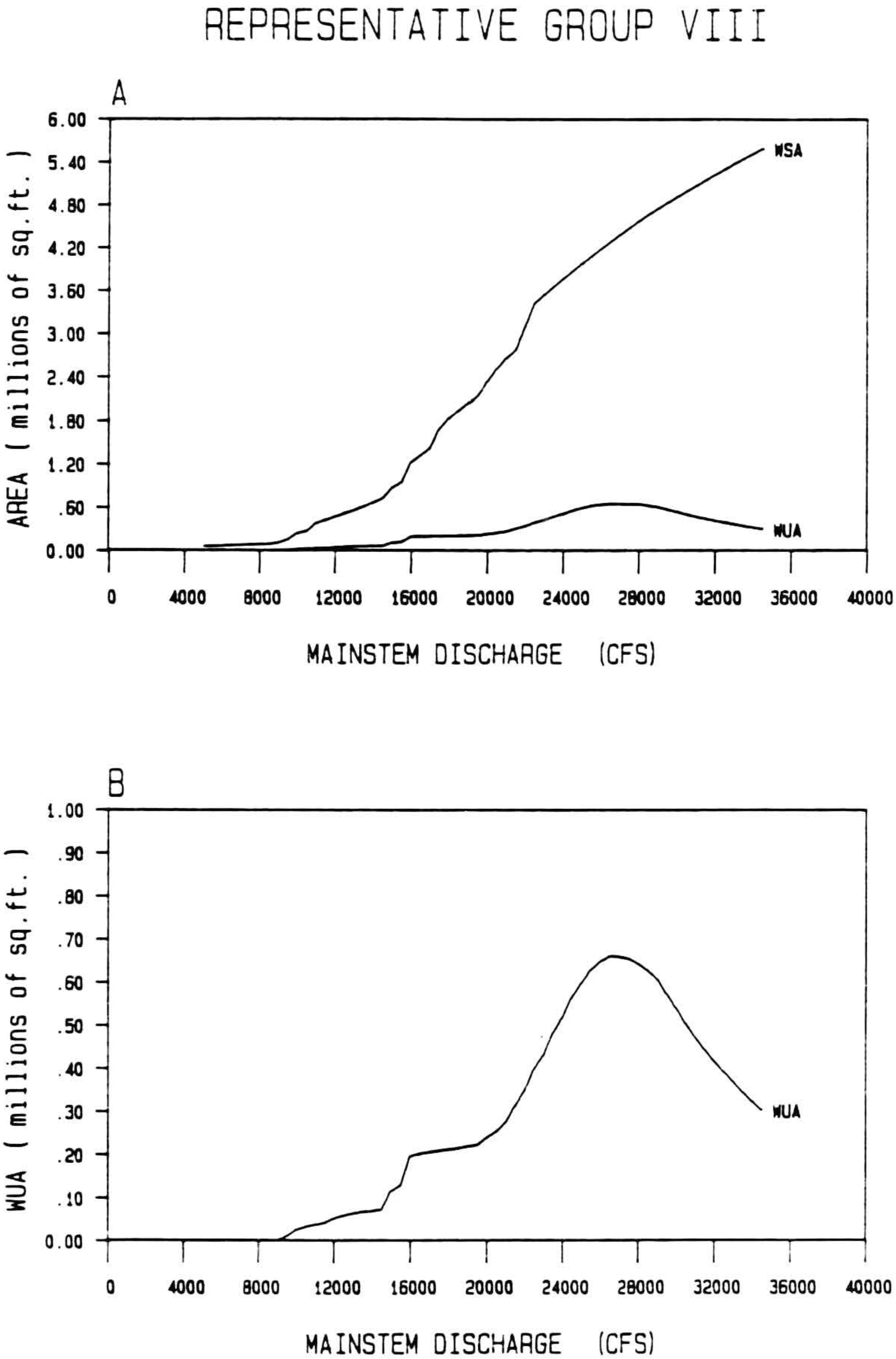


Figure 58. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group VIII of the middle Susitna River.

since some curvature is typical of most specific areas of the middle Susitna River. Curved channels are characterized by a transverse bed slope, with the thalweg located near the outside of the bend. In general, the inside banks of Group IX specific areas are formed by mildly sloped and vegetated gravel bars.

Two habitat modeling sites were selected from the specific areas included in Group IX. Sites 101.5L and 147.1L are large channels classified as mainstem habitat over the entire 5,100 to 23,000 cfs flow range (Plates A-29 through A-32 in Appendix A). Due to an excess of areas with velocities greater than 2.5 fps (i.e., the upper velocity threshold for rearing), the modeling sites provide little juvenile chinook habitat in relation to the total volume of water they convey. This conclusion is strengthened by the large differences observed between WSA and GHA estimates and the low rearing WUA values forecast for all mainstem discharges (Figures 59 and 60). Wetted surface areas change at comparatively slow rates as discharge varies at both sites due to their large size and a tendency to compensate for varying flow more through adjustments in water depth and velocity than in top width.

Both GHA and WUA increase slightly at higher mainstem discharges; thus, the availability of usable rearing habitat and its distribution within the modeling sites tends to remain constant throughout the range of evaluation flows. In a detailed analysis of cross section velocity profiles at Sites 101.5L and 147.1L, Williams (1985) noted that suitable rearing areas are confined to nearshore zones in the channels, primarily along the gently sloped island banks, due to high mid-channel velocities. The ratio of juvenile chinook WUA to wetted surface area at these sites is very low, on

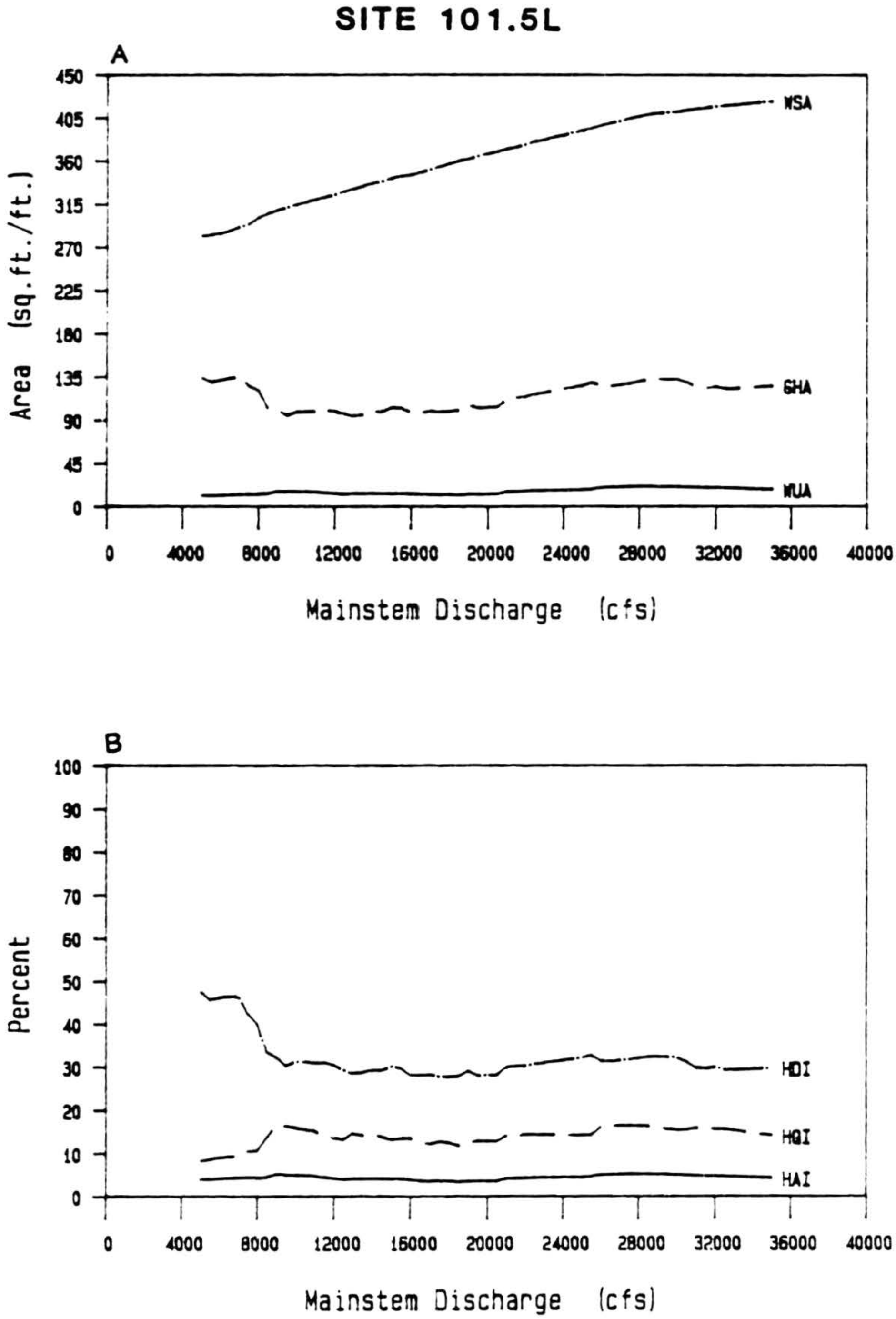
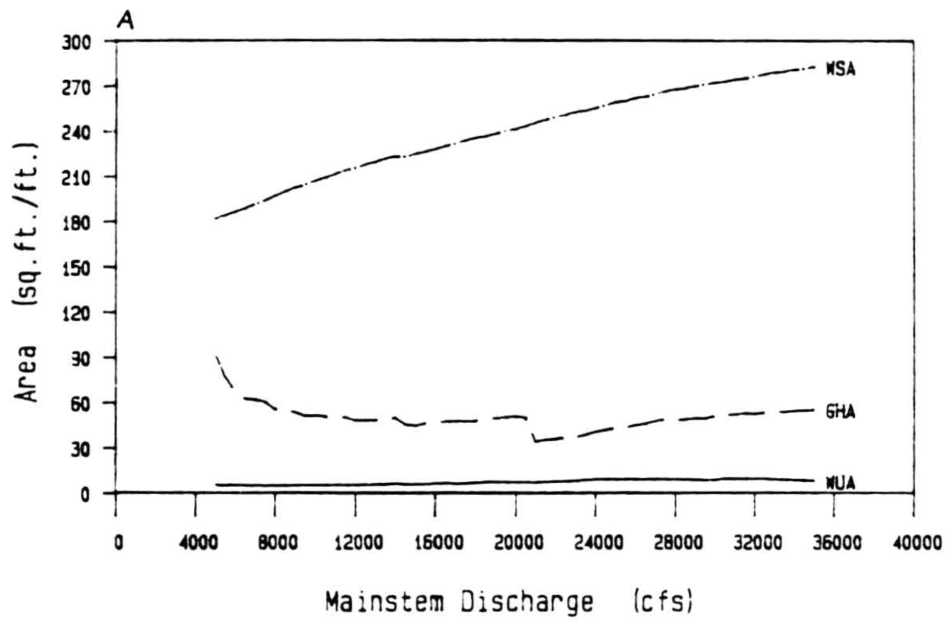


Figure 59. Surface area and chinook rearing habitat index response curves for modeling site 101.5L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

SITE 147.1L



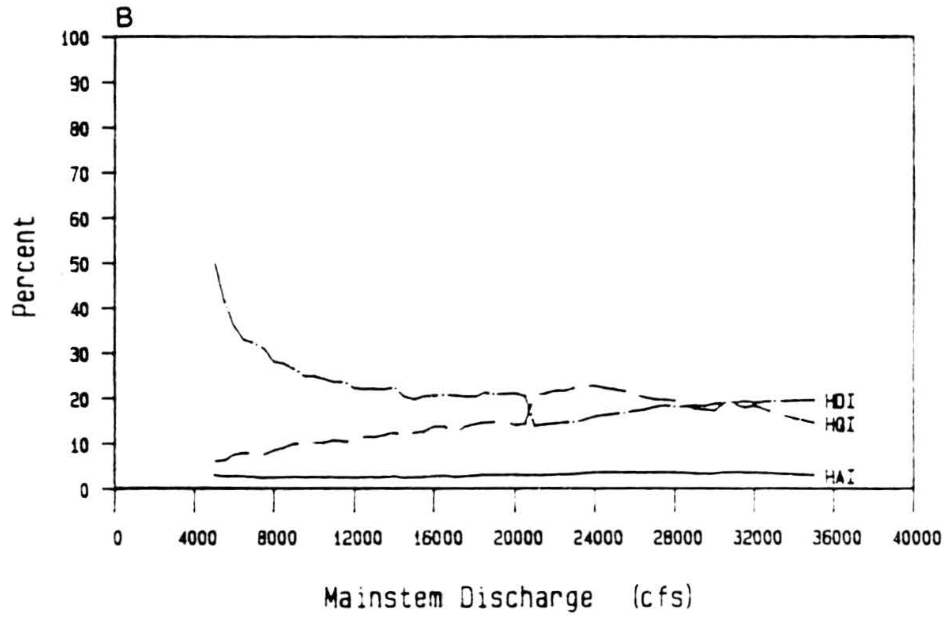


Figure 60. Surface area and chinook rearing habitat index response curves for modeling site 147.1L.
A- Wetted surface area (WSA), gross habitat area (GHA) and weighted usable area (WUA).
B - Habitat availability index (HAI), habitat distribution index (HDI) and habitat quality index (HQI) response functions.

the order of 5 percent or less. These values are considerably lower than HAI estimates obtained for modeling sites from other representative groups. The ratio of WUA to GHA is predictably higher, ranging up to 22 percent, but also slightly lower than HQI ratios calculated for other sites. Taking these indices into account, the juvenile chinook habitat potential within Group IX specific areas is judged to be inferior in quality.

Using the HAI functions developed for Sites 101.5L and 147.1L as templates, HAI curves were derived for specific areas within Group IX. Adjustments were made to account for differences in breaching flow and structural habitat quality. In regard to structural habitat, the mean SHI value for specific areas in this group is high compared to other representative groups. This results from the large substrate sizes which predominate in the high velocity channels and the high cover value assigned to them in the SHI calculations. Nine of the 20 specific areas within Group IX have been grouped with Site 101.5L; the remaining 11 sites are represented by site 147.1L. HAI functions derived for modeled and non-modeled specific areas are presented in Figures 61 and 62 and the aggregate WSA response curve for Group IX in Figure 63.

The collective rearing habitat potential of the 20 specific areas in Group IX increases from 0.3 million square feet at 5,000 cfs to a peak of 0.6 million square feet at 27,500 cfs (Figure 63). Aggregate WUA values increase steadily over this flow range although the rate of change is very low in comparison to other representative groups, with the exception of Group I (upland sloughs), being only slightly greater than the rate of change in wetted surface area. Juvenile chinook WUA remains constant at higher flows as increases in wetted surface area are offset by gradual reductions in rearing habitat availability.

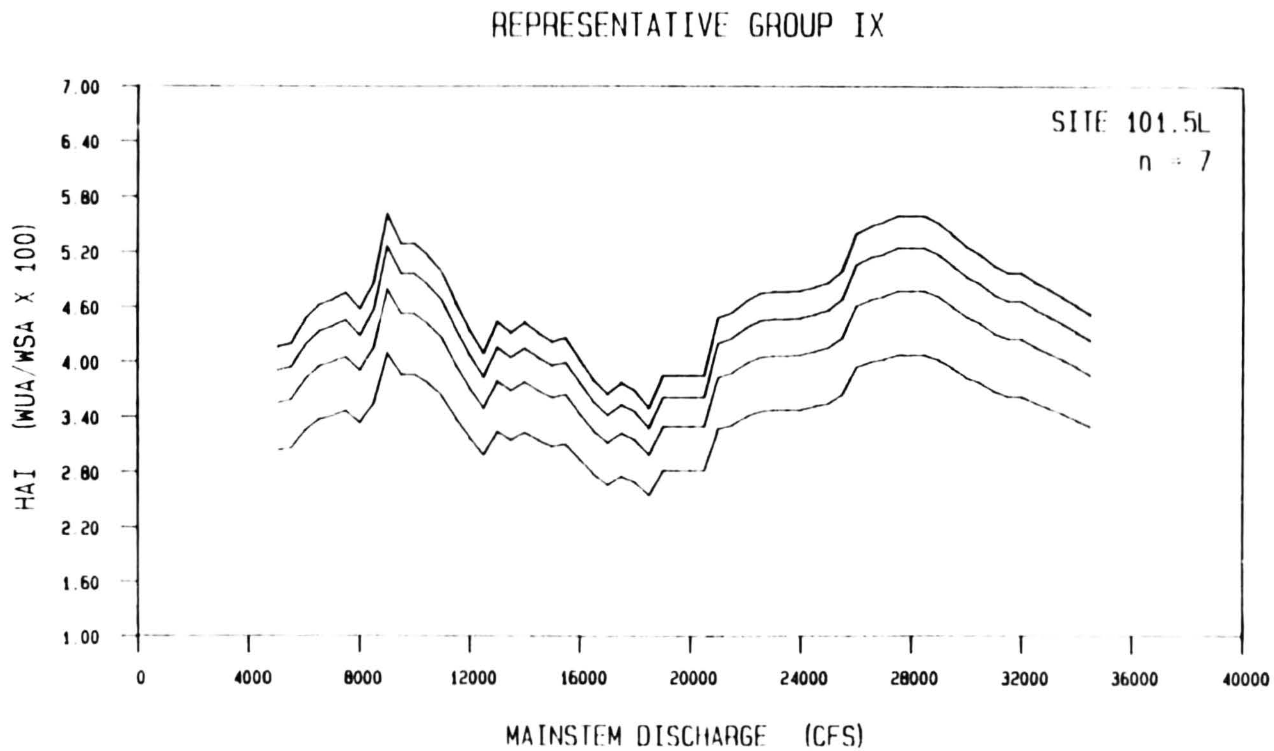


Figure 61. **Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 101.5L of Representative Group IX.**

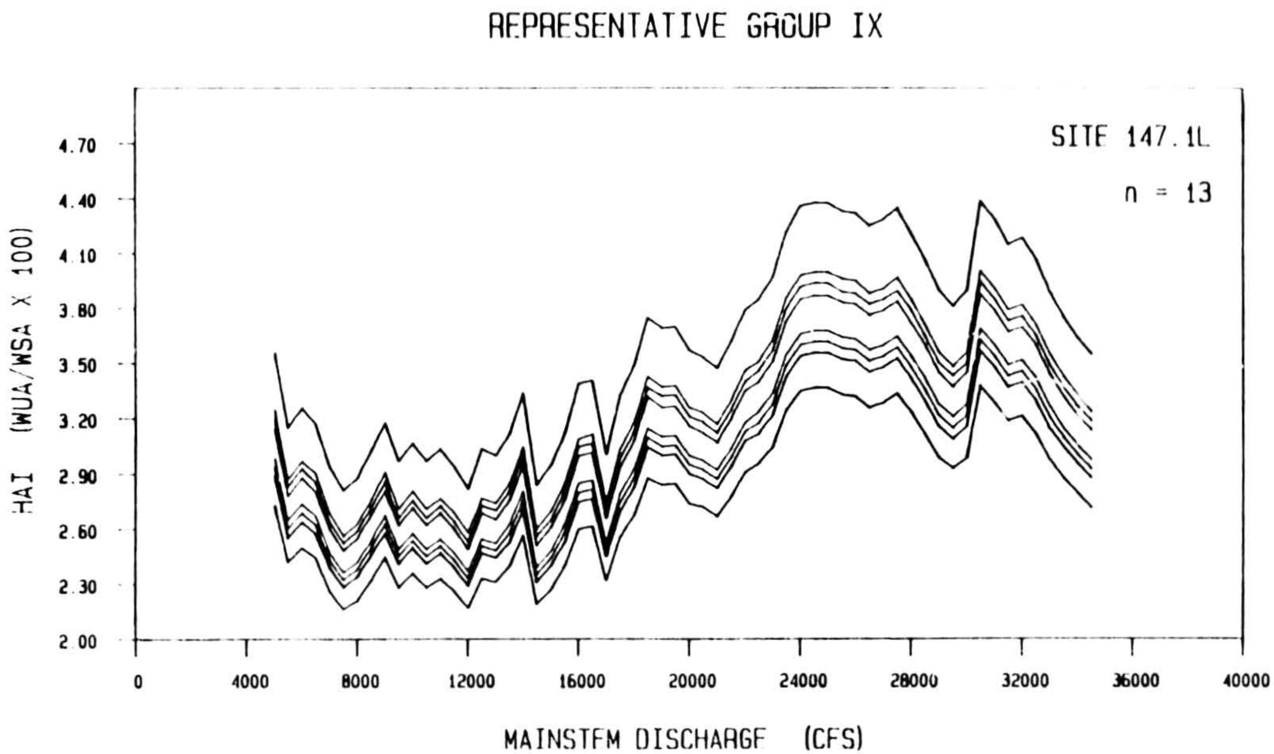


Figure 62. Response of chinook rearing habitat availability to mainstem discharge within non-modeled specific areas of the middle Susitna River which are associated with modeling site 147.1L of Representative Group IX.

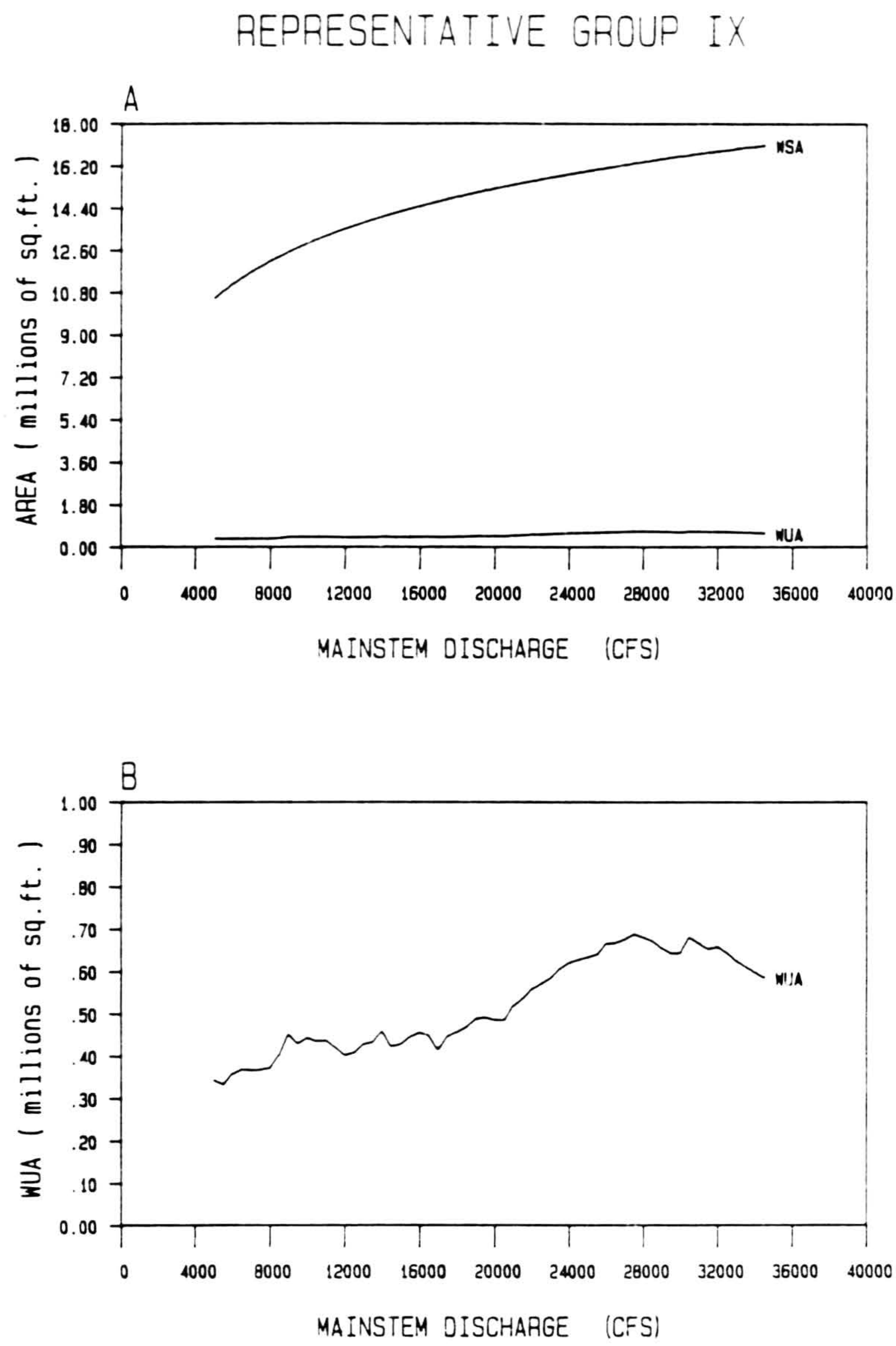


Figure 63. Aggregate response of A - wetted surface area (WSA) and B - chinook rearing habitat potential (WUA) to mainstem discharge in specific areas comprising Representative Group IX of the middle Susitna River.

4.0 SUMMARY

The physical habitat modeling presented in this report provides a quantitative evaluation of the response of juvenile chinook weighted usable area to incremental changes in streamflow for the middle Susitna River. Underpinning the extrapolation methodology are several assumptions related to physical habitat modeling and river stratification procedures.

The primary assumption of the habitat modeling studies is that weighted usable area (WUA) is an index of physical habitat conditions and changes in WUA are attended by adjustments in the distribution and relative abundance of juvenile chinook populations. Although other physical and non-physical components of fish habitat not included in the calculation of WUA may influence the survival and growth of juvenile chinook salmon, the physical environment affects to a substantial degree biotic processes of the aquatic community. Moreover, considerable data exist which indicate the importance of individual microhabitat variables for influencing the distribution of juvenile chinook within different subenvironments of the middle Susitna River. Hence, physical habitat modeling is an appropriate method for assessing the influence of project-induced changes in streamflow on juvenile chinook habitat.

It is recognized that numerous environmental variables influence the availability of chinook rearing habitat and that these variables are typically not independent of one another. Under some circumstances, however, the availability or quality of juvenile chinook habitat may be governed primarily by one or two variables whose influence is more pronounced than the combined effect of all other environmental variables. An example is the positive correlation during the summer growing period between juvenile chinook distribution and turbid water. This may reflect the value of turbidity as cover for juvenile chinook as reported by Dugan et al. (1984) or it may reflect a greater abundance of drifting invertebrate prey in the turbid mainstem and side channel habitats than in clear water sloughs.

Water clarity was treated as a cover variable in the physical habitat modeling studies since our present understanding of turbidity, food availability, and juvenile chinook distribution does not warrant an evaluation of the relationship of turbidity to food supply. Nevertheless, if it is drifting invertebrate prey associated with turbid mainstem and side channel flow which juvenile chinook are responding to rather than the cover value of turbidity, the physical habitat model remains valid. For it is the influence of turbidity on juvenile chinook distribution, not the cause, which is being modeled.

The influence of water clarity was incorporated into the modeling process through the application of separate clear and turbid water habitat suitability criteria for juvenile chinook. Clear water velocity and cover suitability criteria were used to calculate rearing WUA indices for modeling sites under non-breached conditions. Following breaching high turbidities prevailed at the modeling sites and turbid water criteria were applied.

The results of the rearing habitat modeling studies conducted at individual modeling sites indicate surface area and rearing habitat response curves are generally more similar within representative groups (where two or more modeling sites occur) than between groups. The amount of rearing habitat available at a particular site is strongly affected by the mainstem discharge at which its upstream berm is overtopped. Under non-breached conditions, juvenile chinook habitat is typically relatively small. The combination of the influx of turbid water to the channel and the increase in its wetted surface area which accompany breaching typically increases the availability of rearing habitat significantly. Positive gains of WUA continue, but at a gradually declining rate, as mainstem discharge increases and water velocities at the site remain favorable. Juvenile chinook habitat tends to decrease more rapidly in smaller channels as mainstem discharge increases than in larger channels due to a more gradual response of near shore velocities to changes in flow in large channels. Thus, relatively small changes in the availability of rearing habitat occur as flows increase or decrease in the large side channels and mainstem. It should be emphasized, however, that these large side channels and the mainstem contribute a disproportionately small amount of habitat in relation to their wetted surface area.

Based on the delineation of specific areas and their classification into the representative groups reported by Aaserude et al. 1985, we have developed aggregate rearing habitat response functions for the majority of the subenvironments which directly respond to changes in mainstem discharge. These are summarized in Figure 64. We have not combined WUA values for the representative groups to obtain an aggregate WUA value for the entire middle Susitna River. Evidence of variability in juvenile chinook abundance and distribution between representative groups is provided by

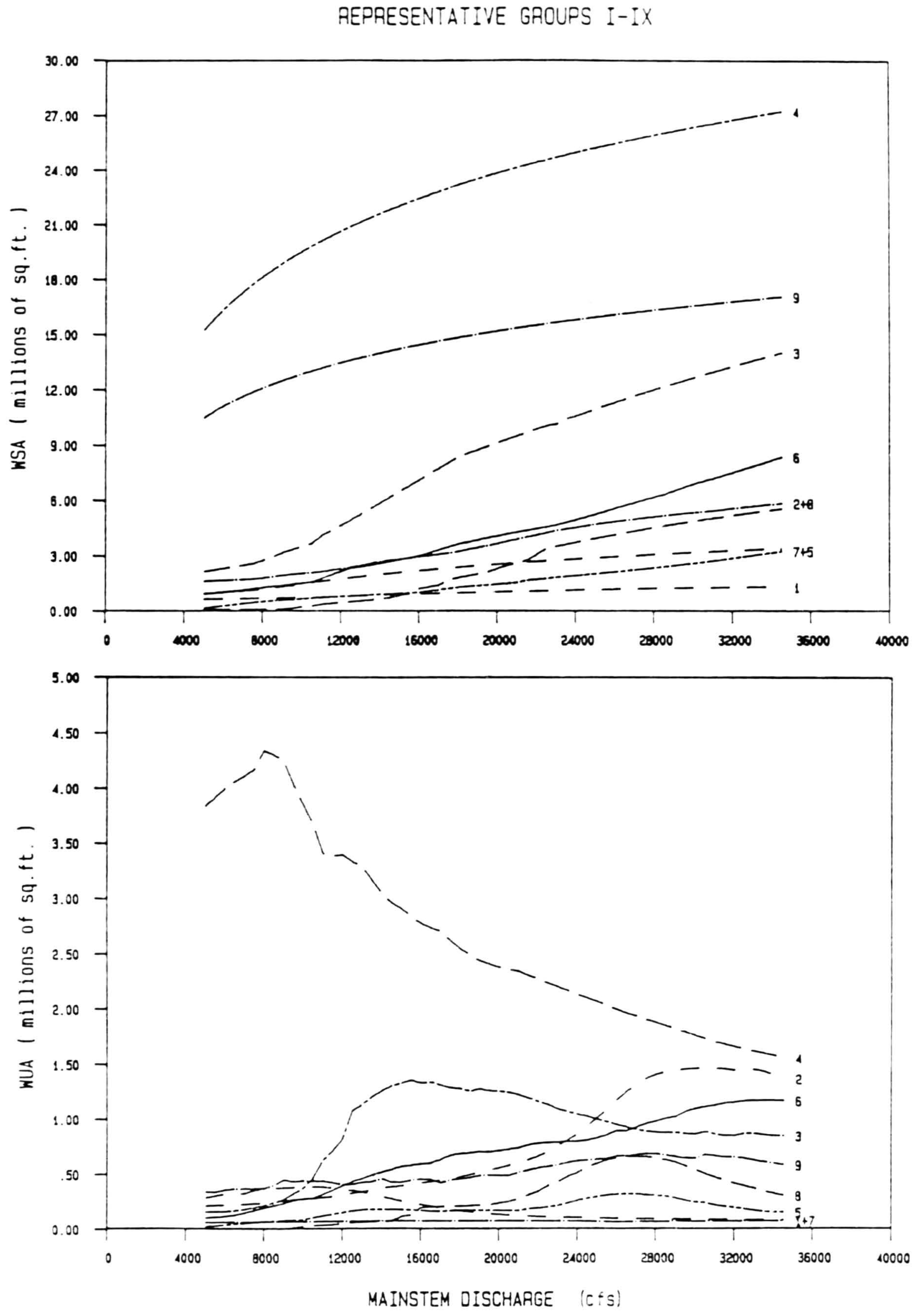


Figure 64. Comparison of the aggregate response of chinook rearing habitat potential [WUA] for Representative Groups I through IX.

Hoffman (1985), suggesting that WUA indices for different representative groups be adjusted for utilization prior to being aggregated.

Other considerations which should be addressed prior to drawing final conclusions from the habitat response functions provided in this report are the influences of food availability and water temperature on the quality of rearing habitats. In addition such seasonal aspects as availability of chinook overwintering habitat should be considered. The habitat modeling results presented in this report are not directly applicable to evaluations of winter habitat since hydraulic characteristics and fish behavior are different at this time of year. In regard to the open water period, however, time series and habitat duration analyses at the representative group level are recommended for comparisons between groups and flow regimes. Whereas the primary utility of the WUA response functions is their application to existing habitat conditions, the general shape of the WUA response functions are also well-suited to assessing with-project effects on juvenile chinook habitat.

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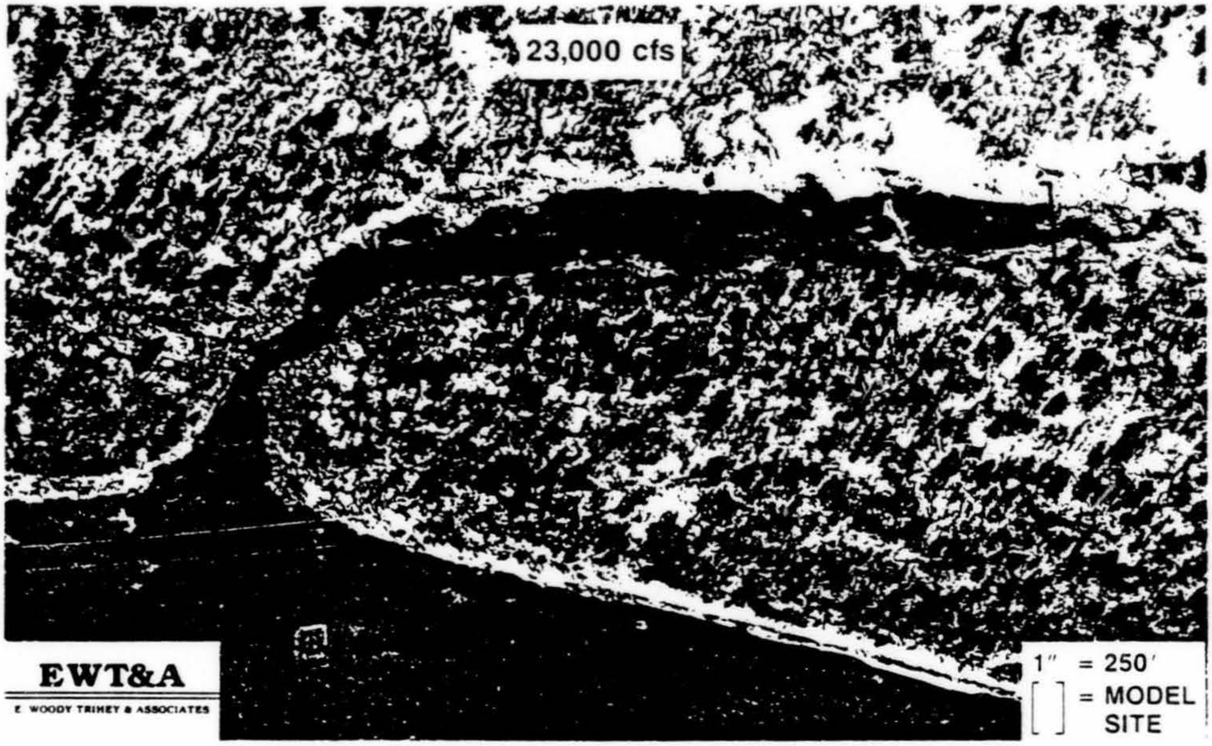
APPENDIX A

AERIAL PHOTOGRAPHY OF MODELING SITES

(PLATES A-1 THROUGH A-32)



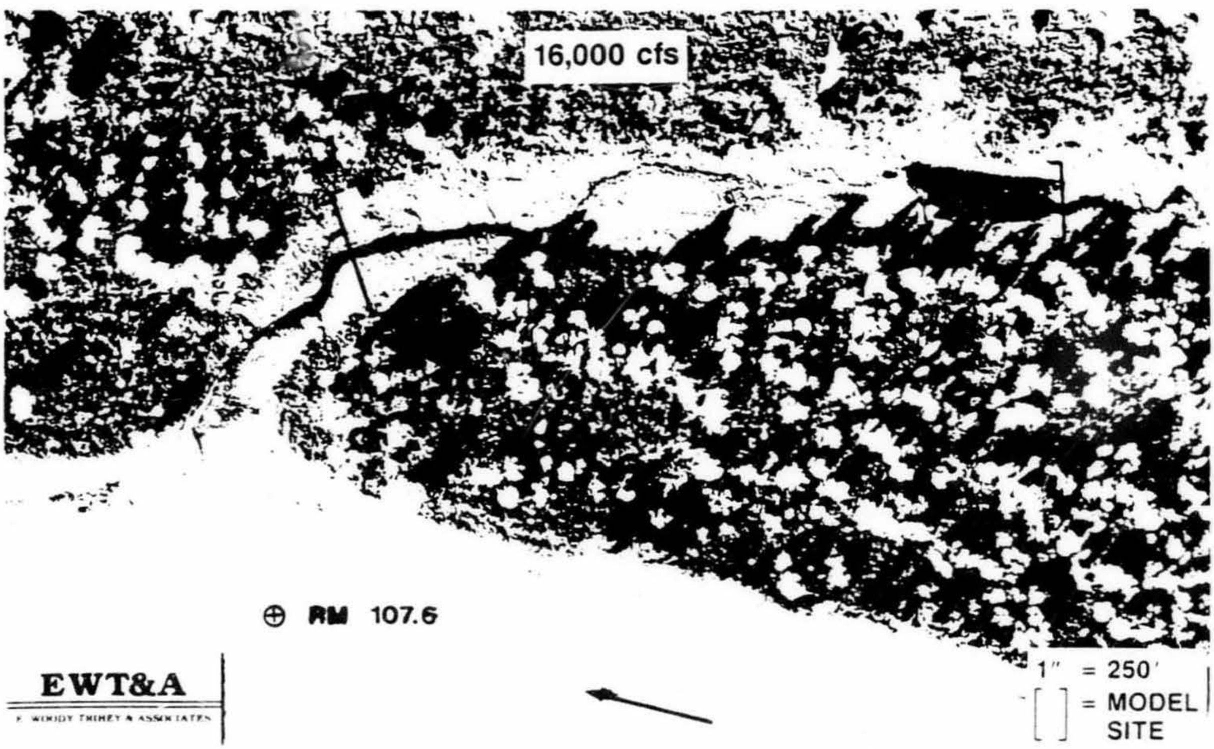
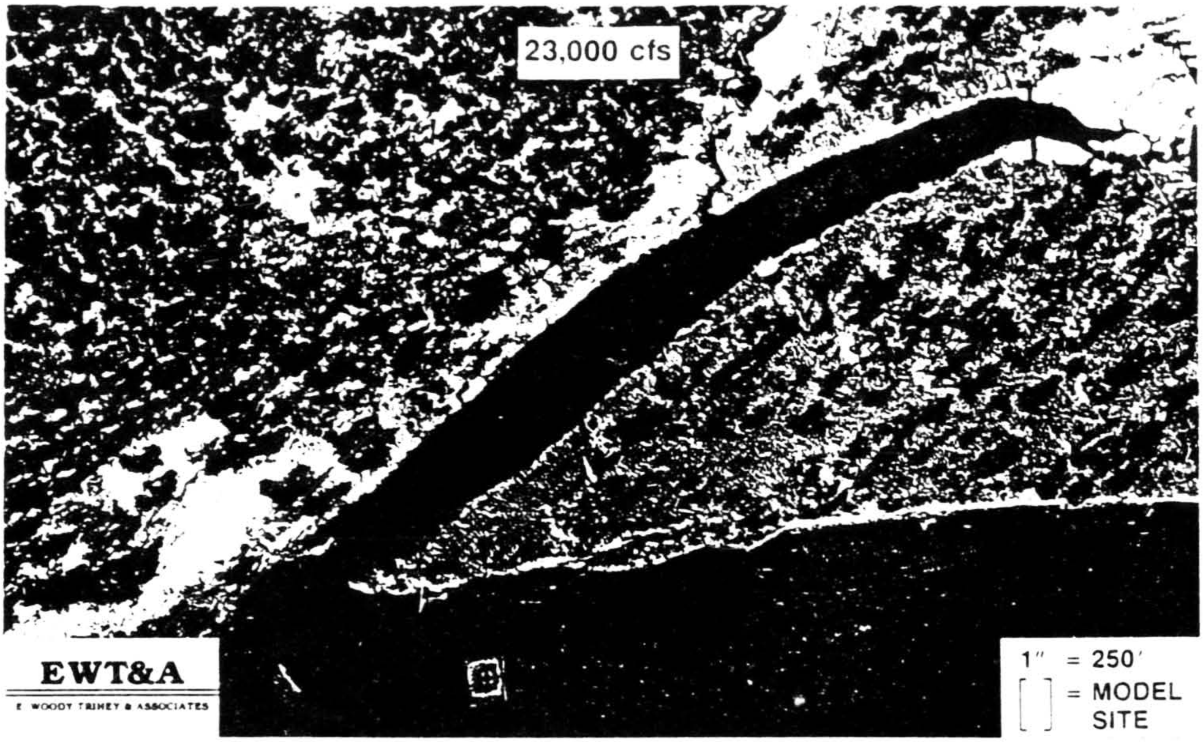


Plate A-1 Aerial photography of modeling site 107.6L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at >35,000 cfs and is included in Representative Group I.



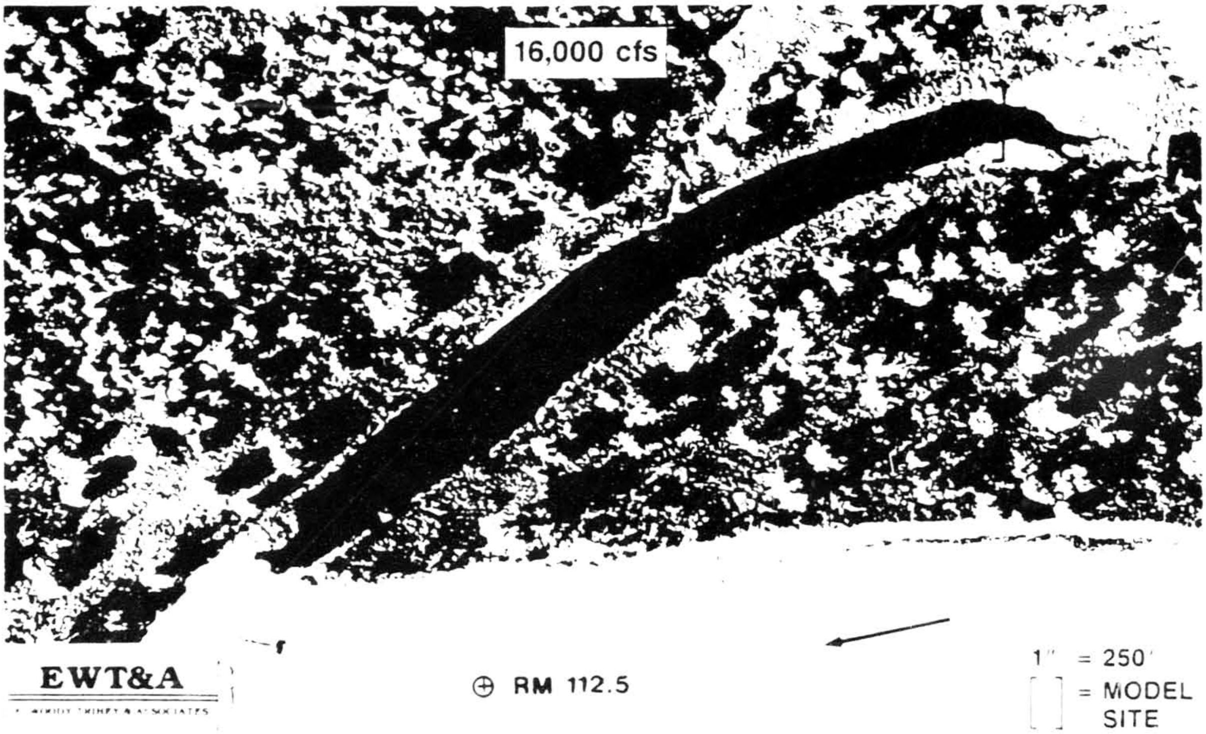
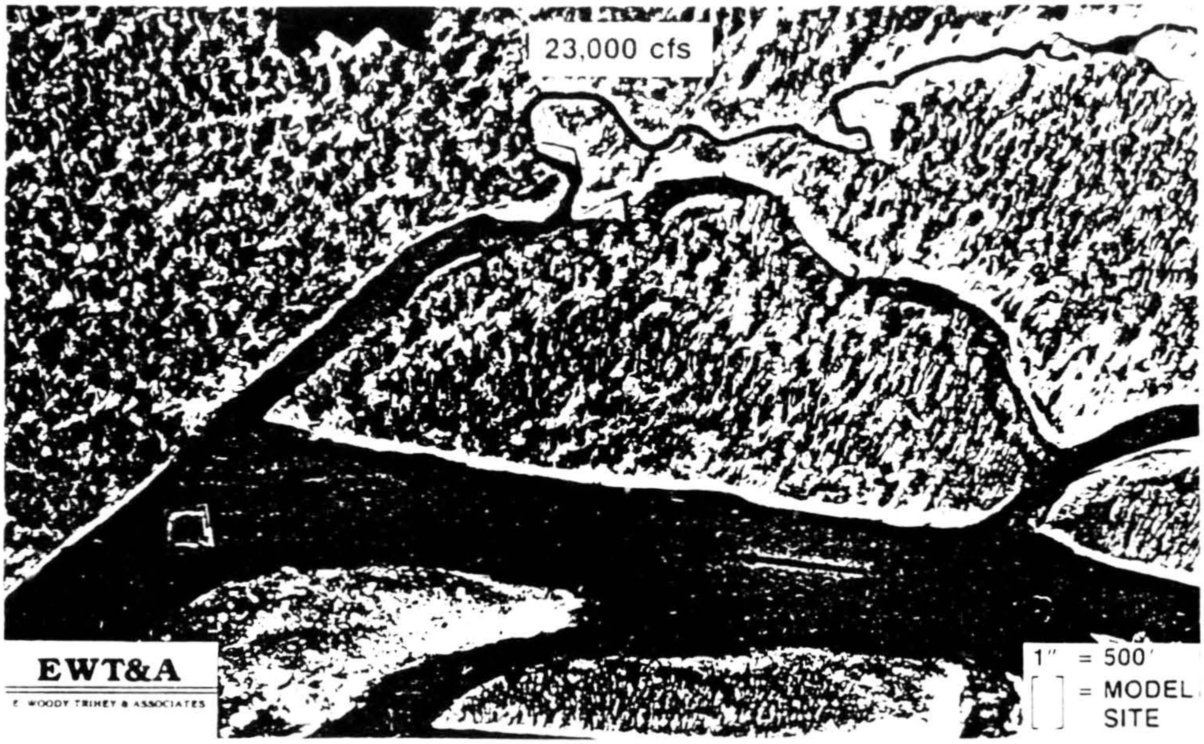


Plate A-2 Aerial photography of modeling site 112.5L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at >35,000 cfs and is included in Representative Group I.



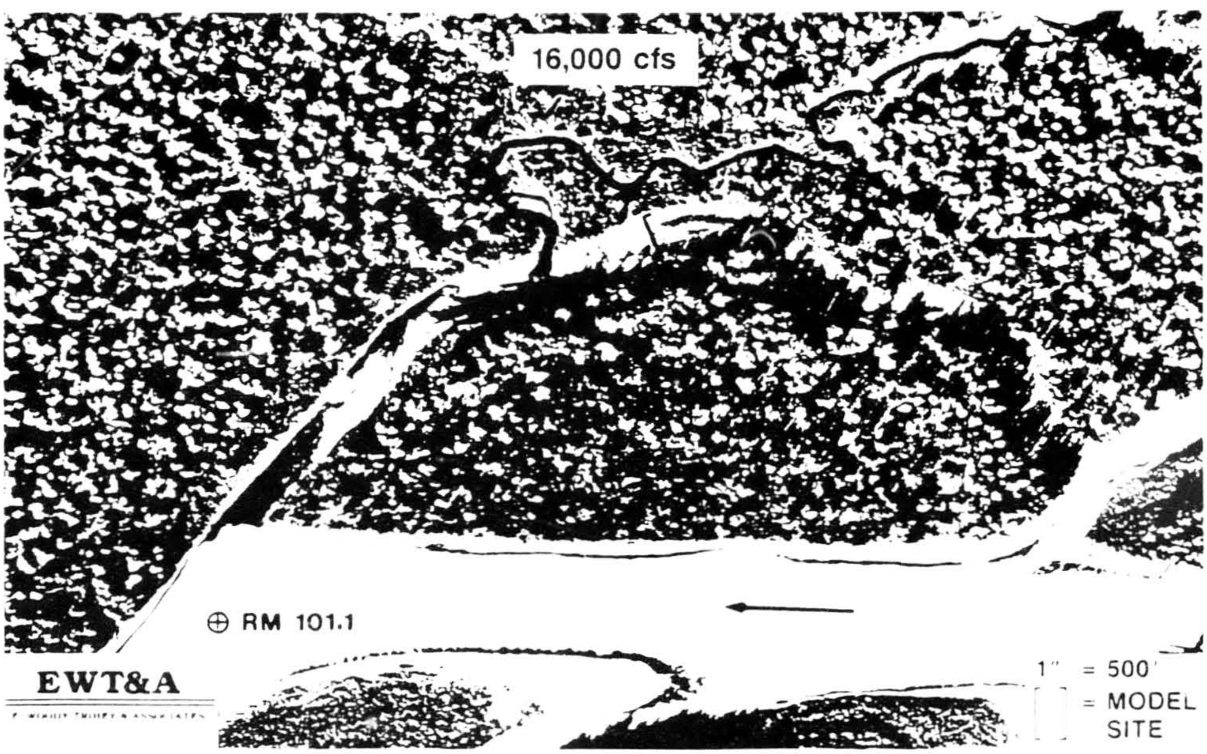
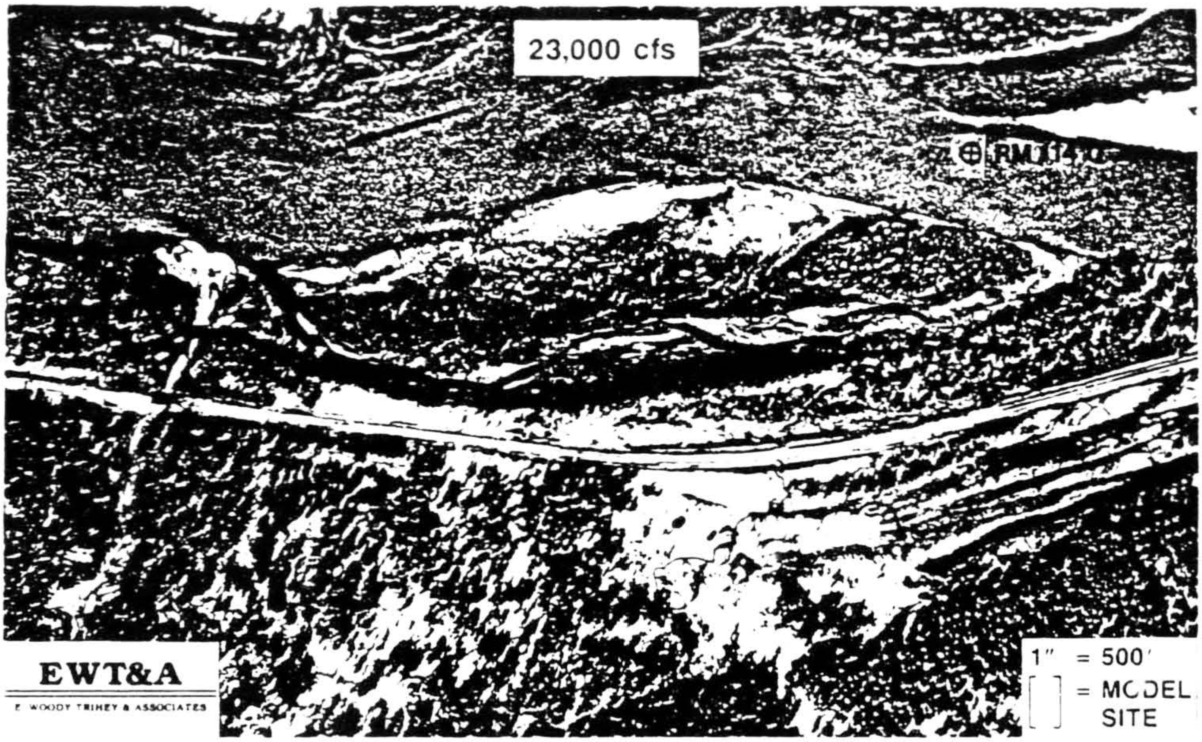


Plate A-3 Aerial photography of modeling site 101.4L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 22,000 cfs and is included in Representative Group II.



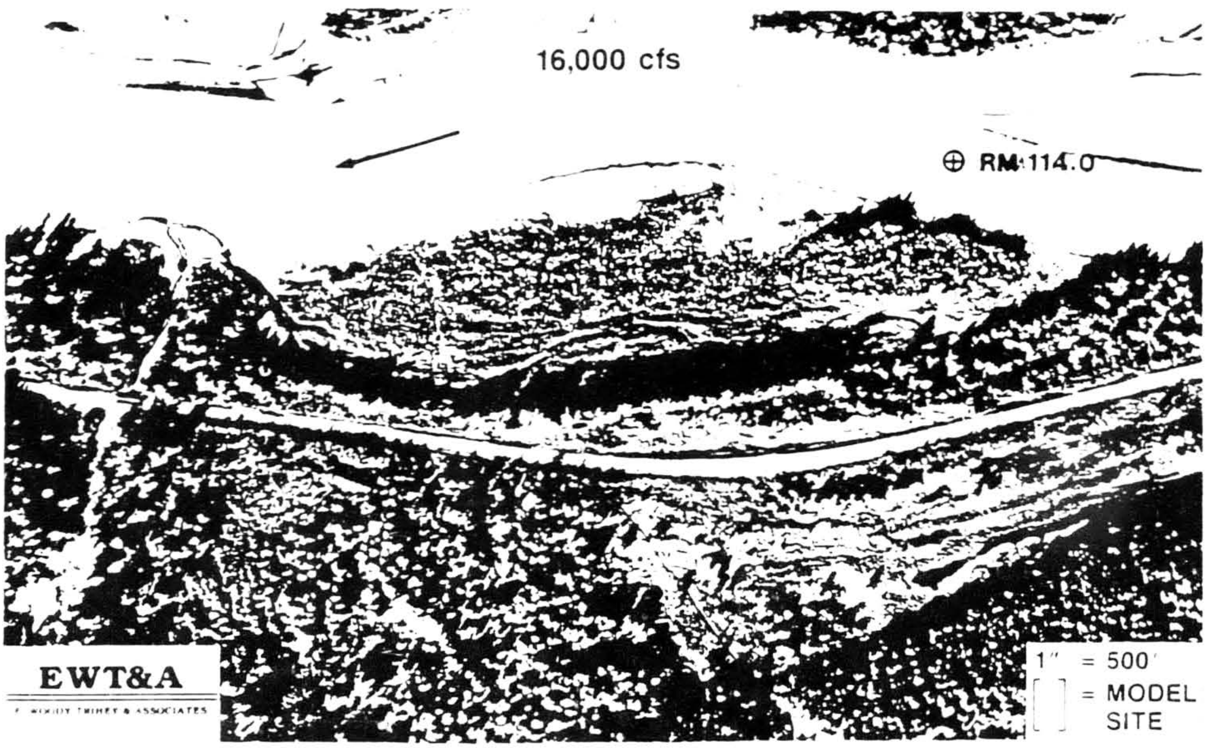
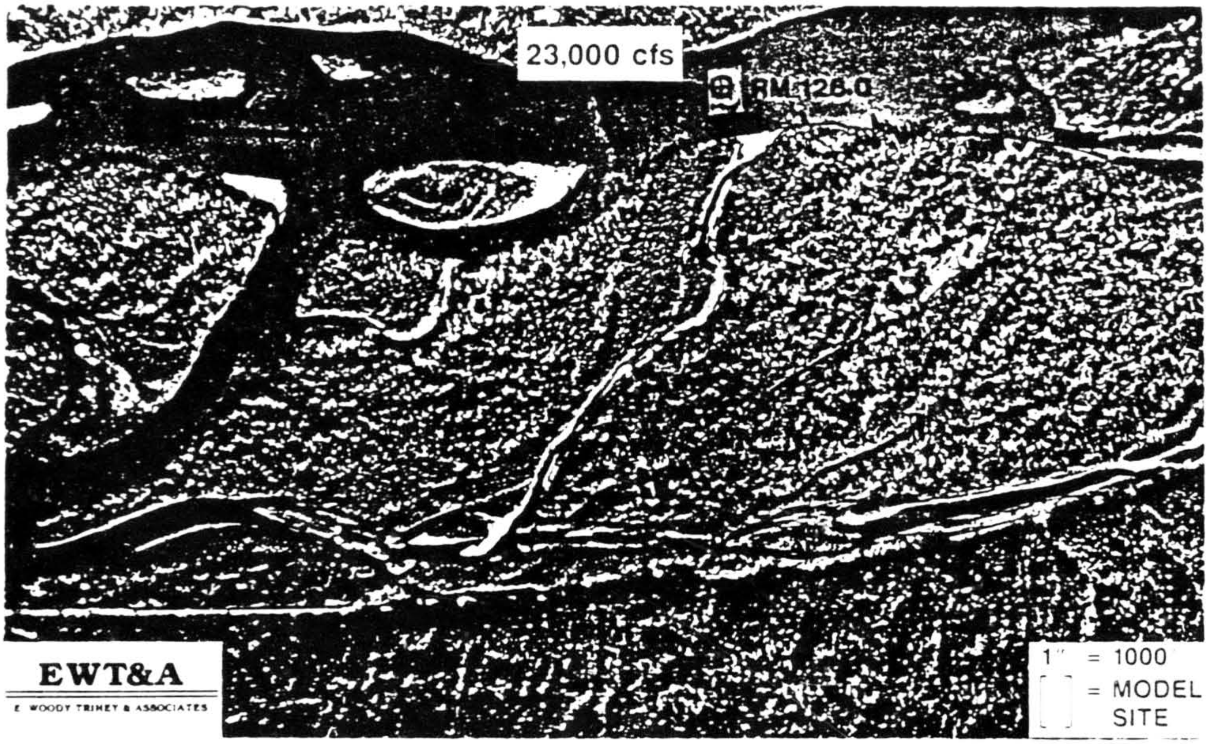


Plate A-4 Aerial photography of modeling site 113.7R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 24,000 cfs and is included in Representative Group II.



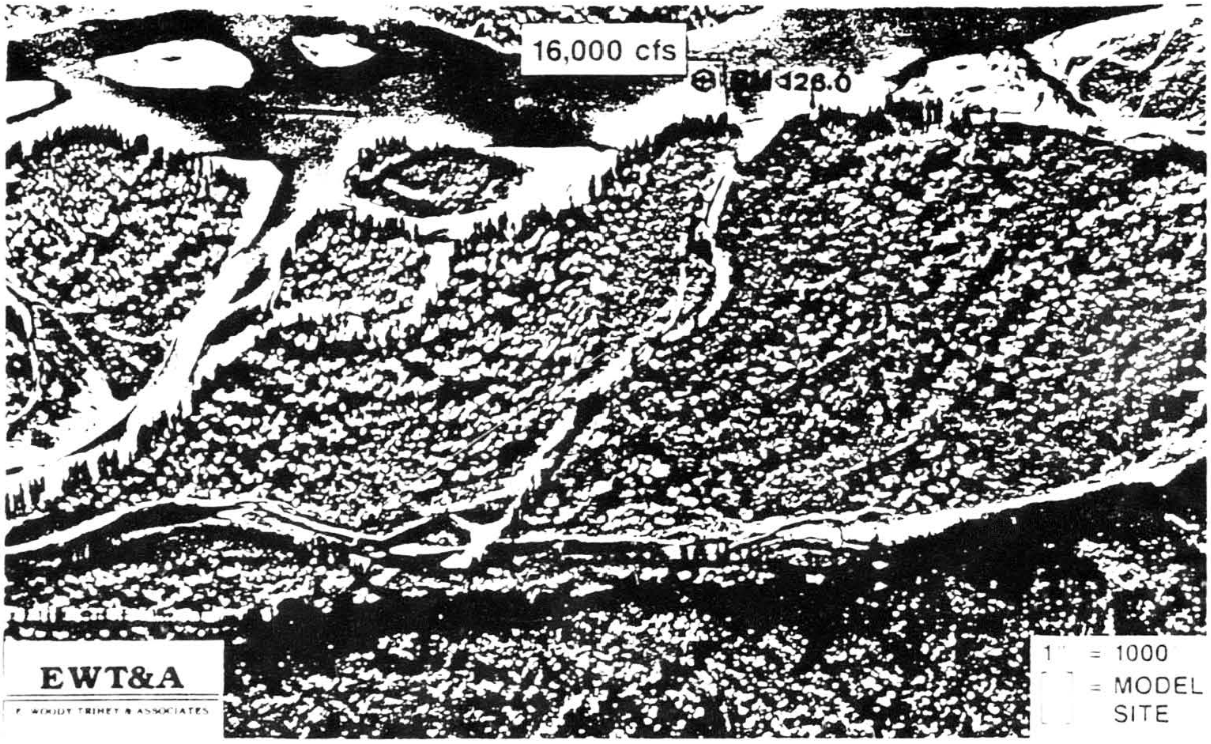
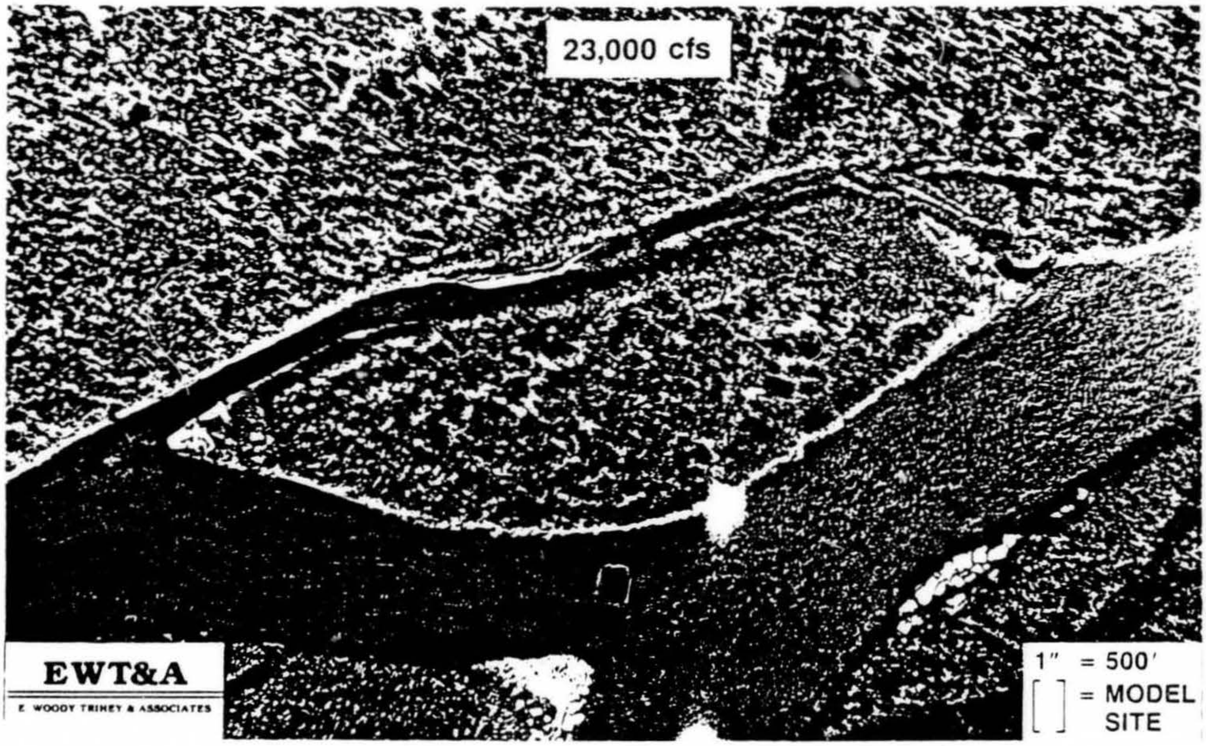


Plate A-5 Aerial photography of modeling site 126.0R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 33,000 cfs and is included in Representative Group II.



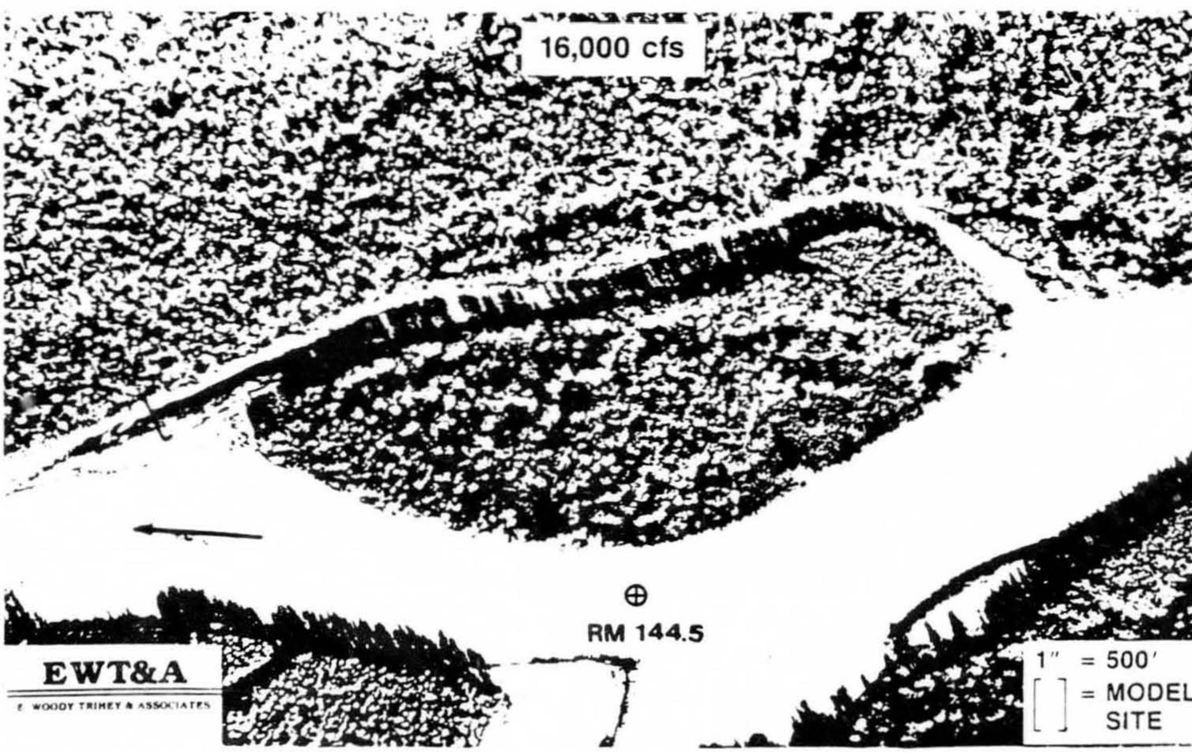
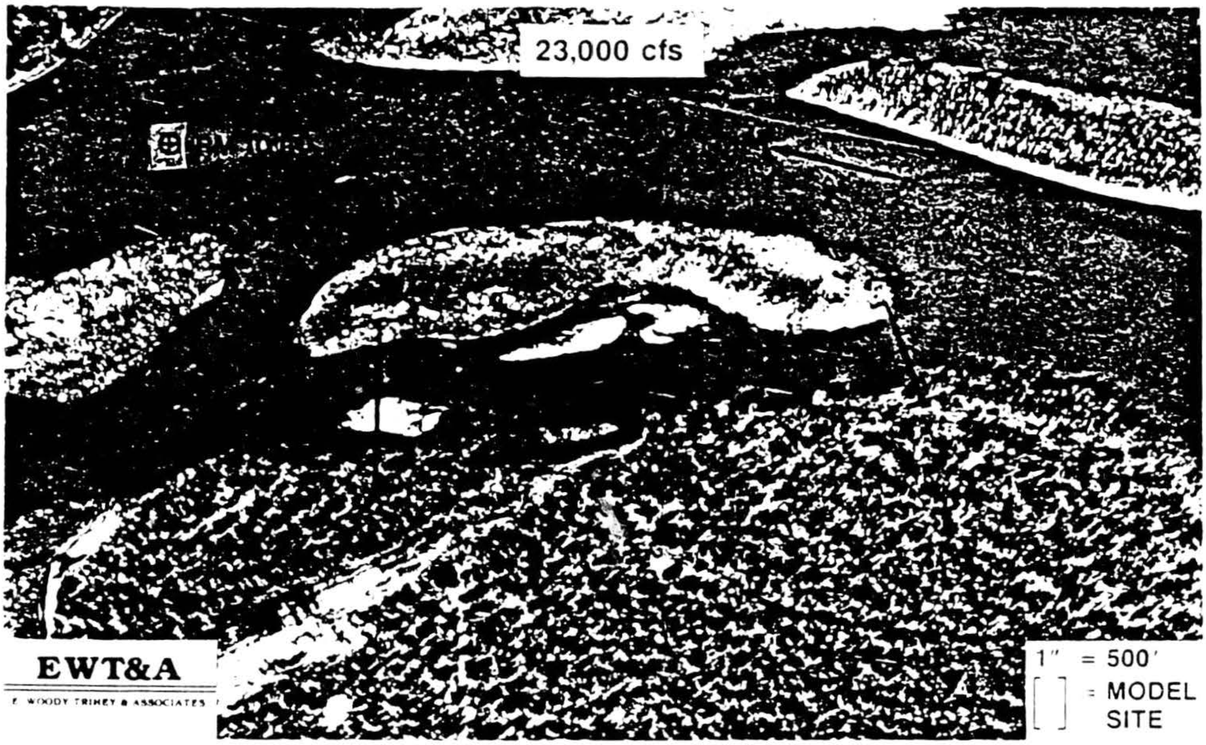


Plate A-6 Aerial photography of modeling site 144.4L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 21,000 cfs and is included in Representative Group II.



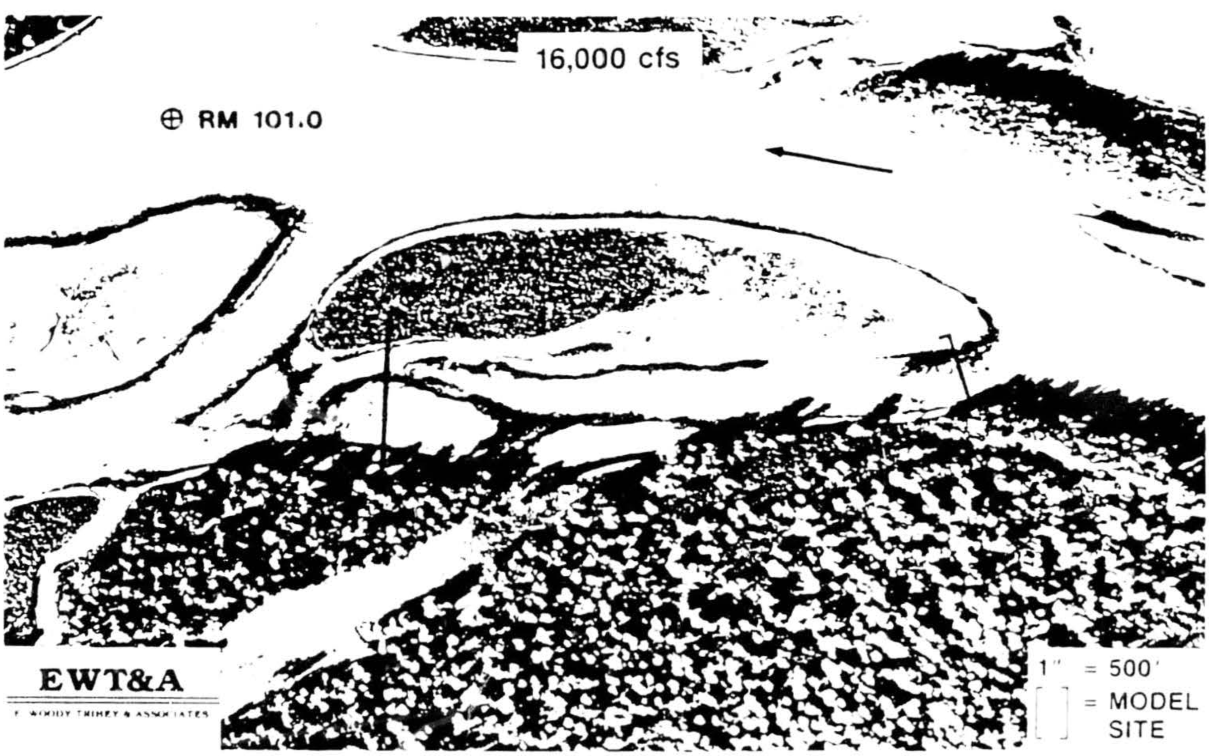
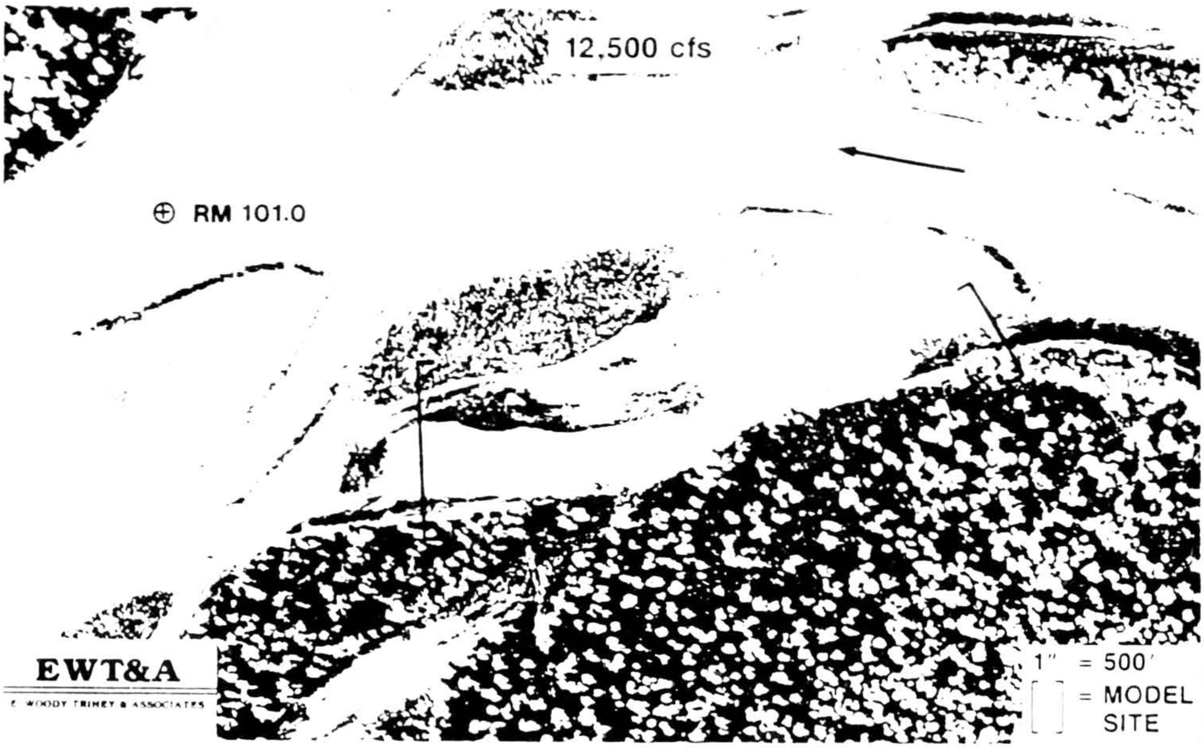


Plate A-7 Aerial photography of modeling site 101.2R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 9,200 cfs and is included in Representative Group III.



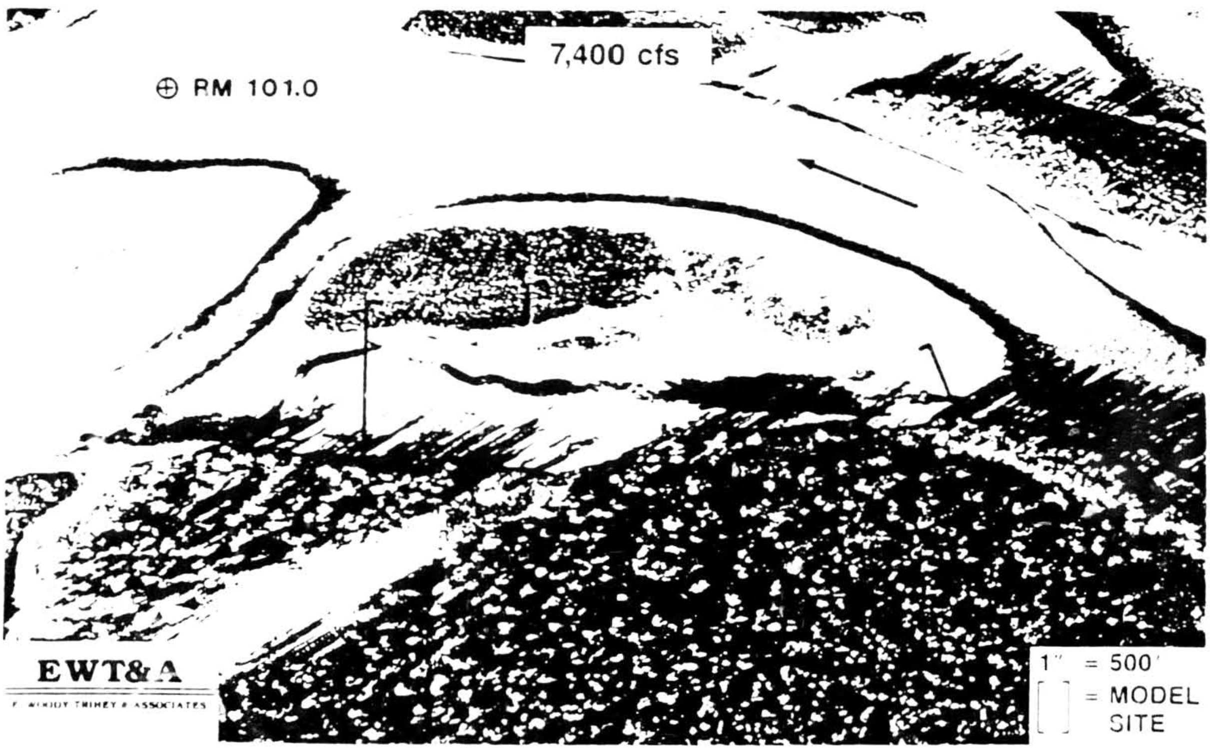
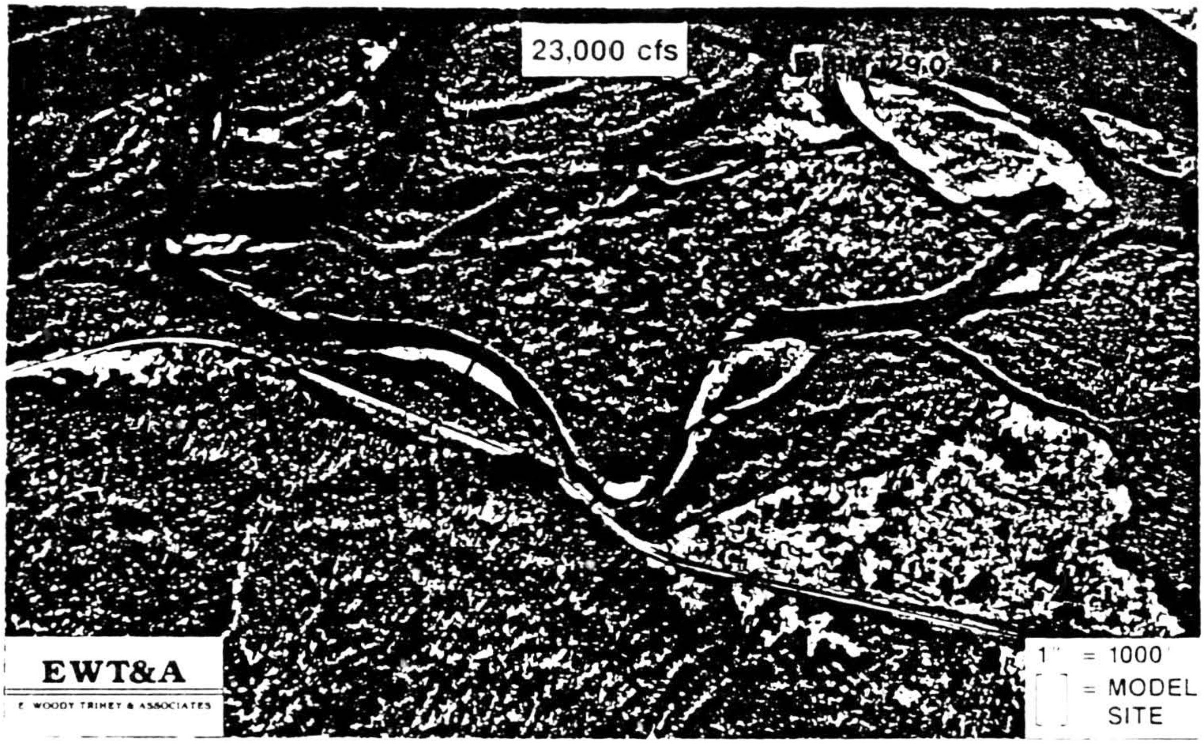


Plate A-8 Aerial photography of modeling site 101.2R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 9,200 cfs and is included in Representative Group III.



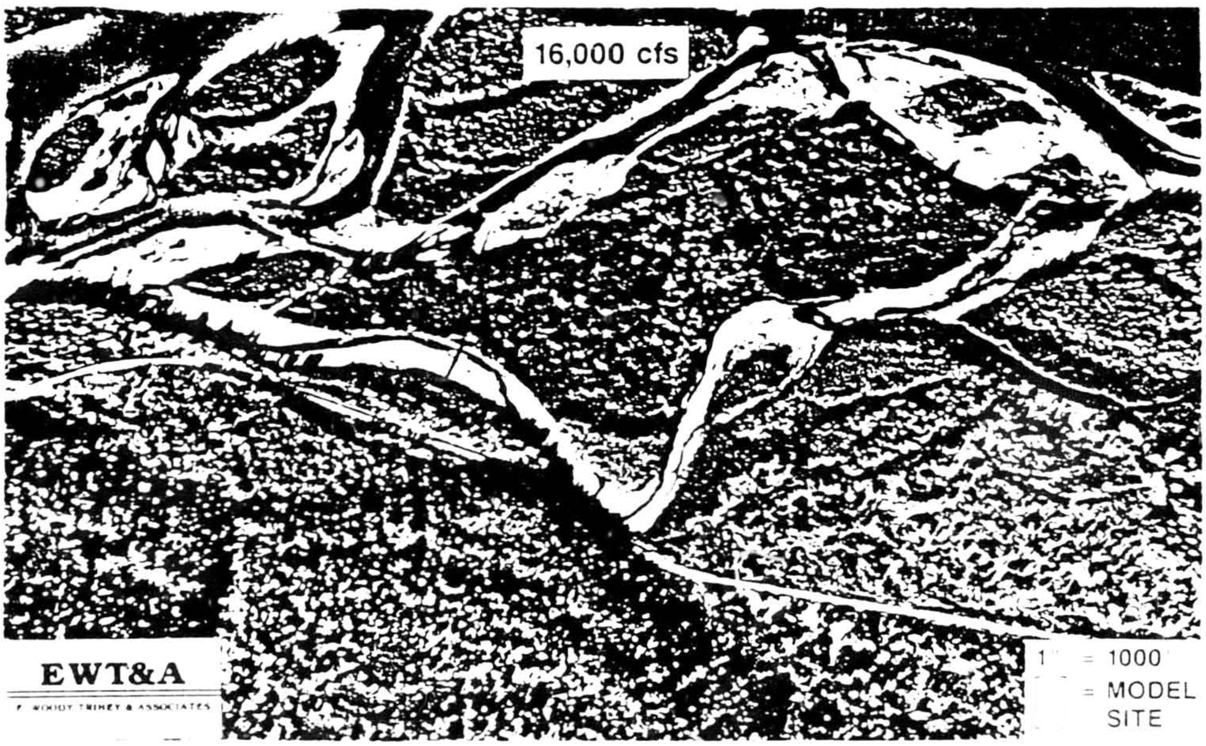
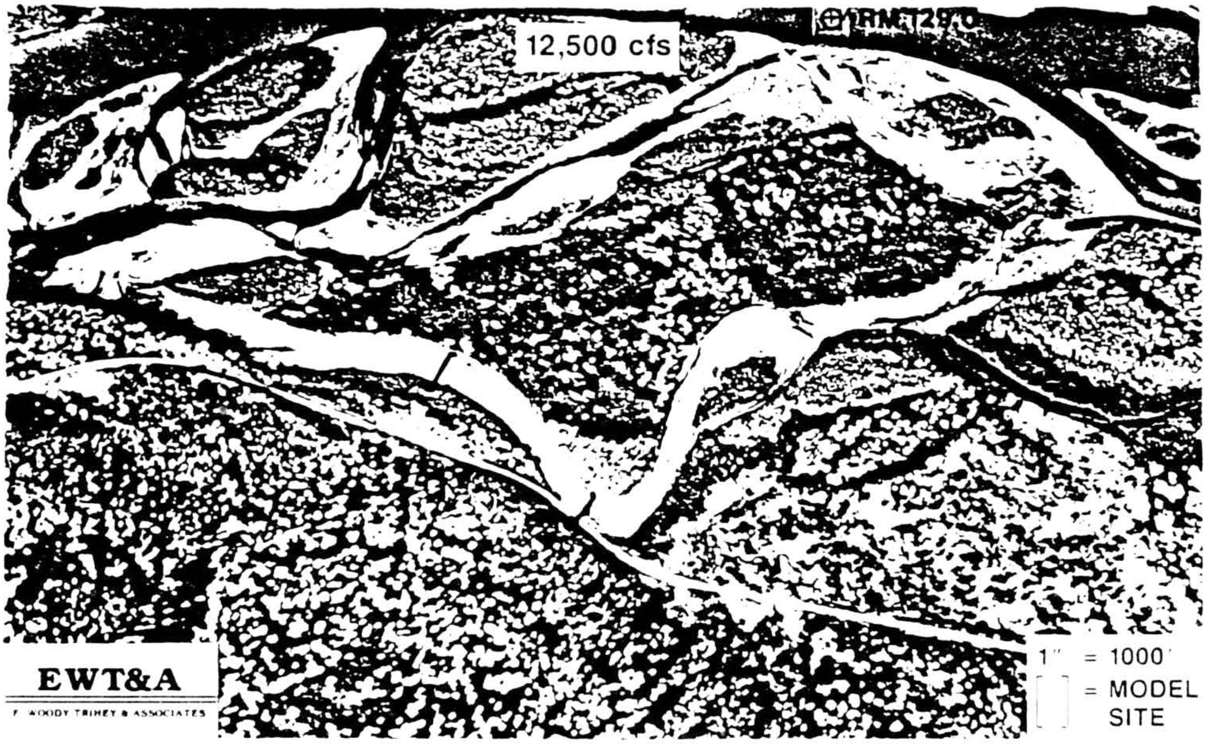


Plate A-9 Aerial photography of modeling site 128.8R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 16,000 cfs and is included in Representative Group III.



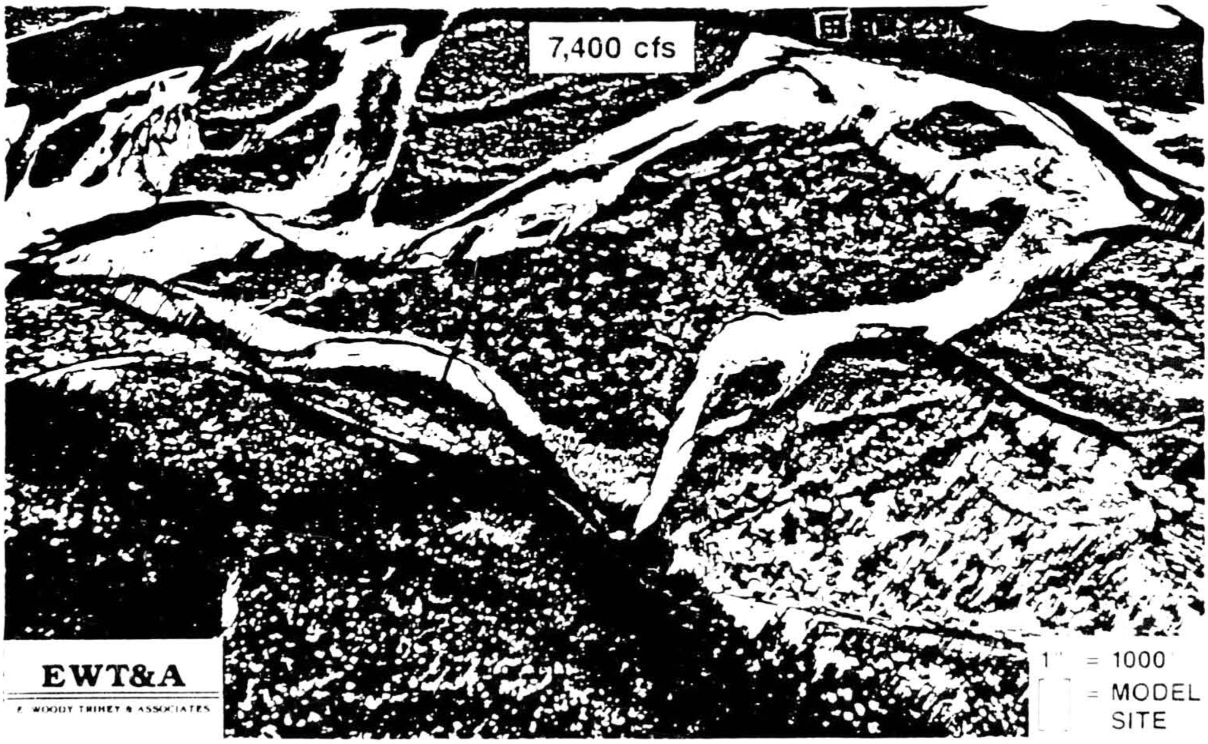
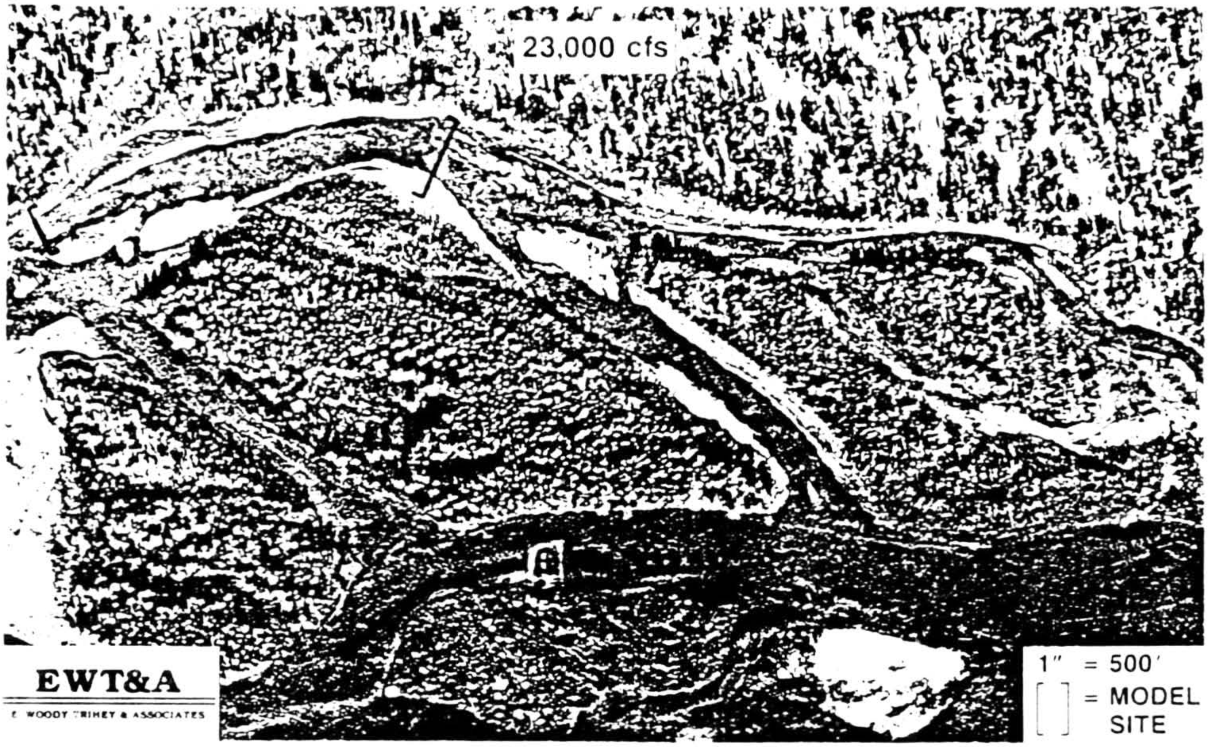


Plate A-10 Aerial photography of modeling site 128.8R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 16,000 cfs and is included in Representative Group III.



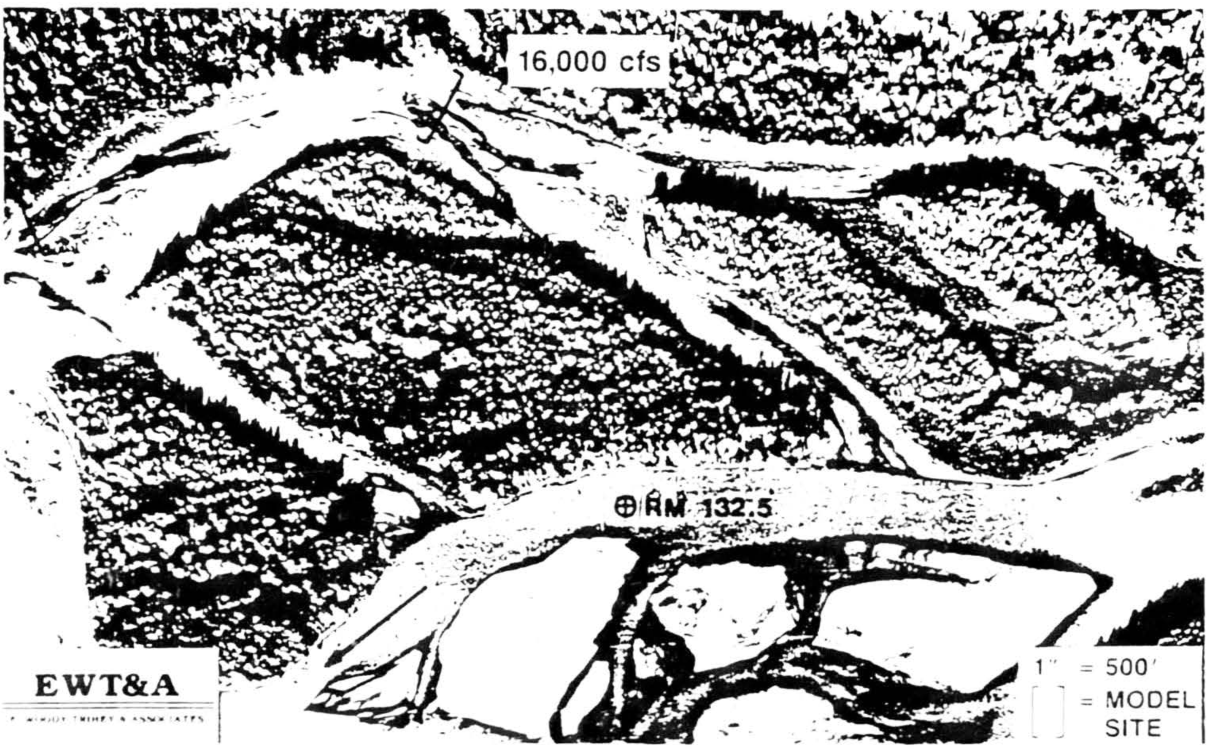
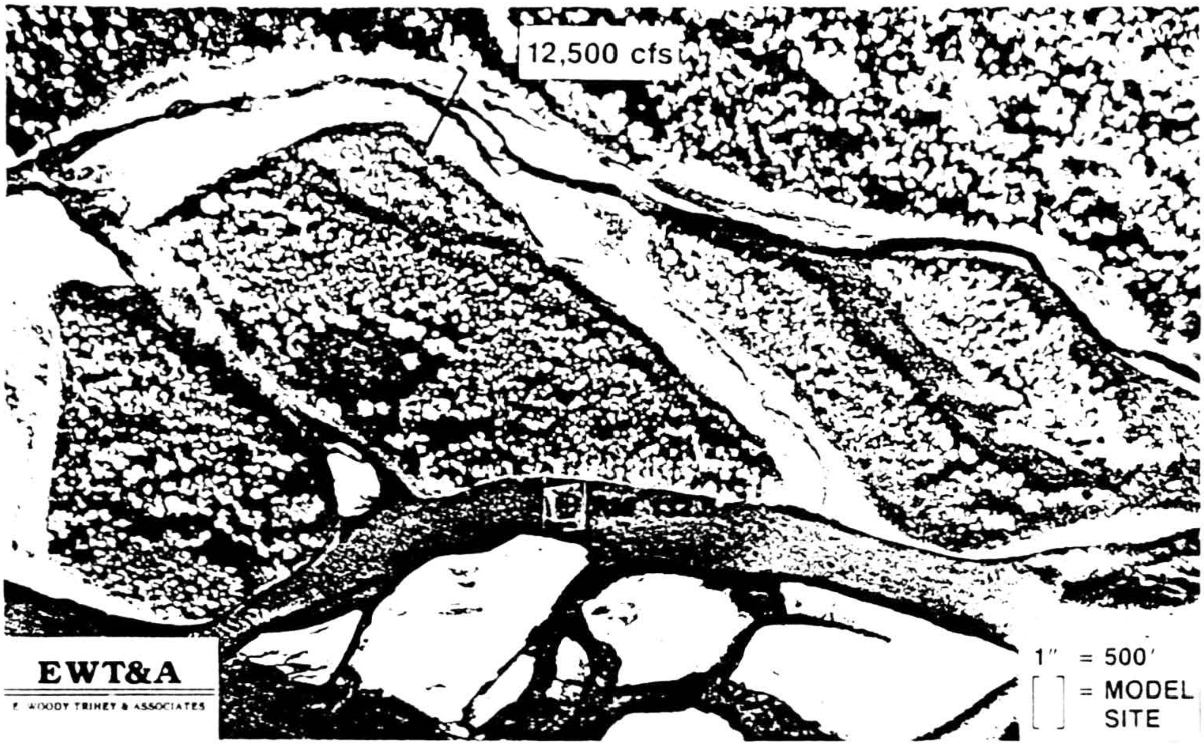


Plate A-11 Aerial photography of modeling site 132.6L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 10,500 cfs and is included in Representative Group III.



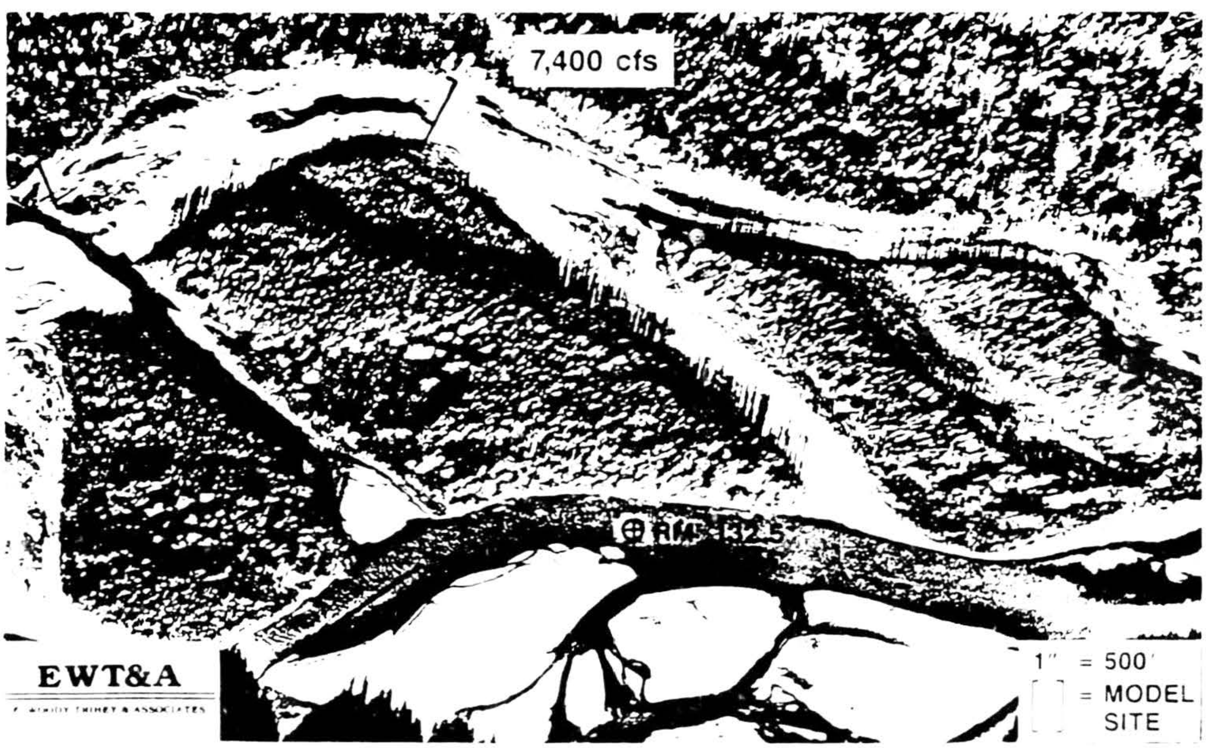
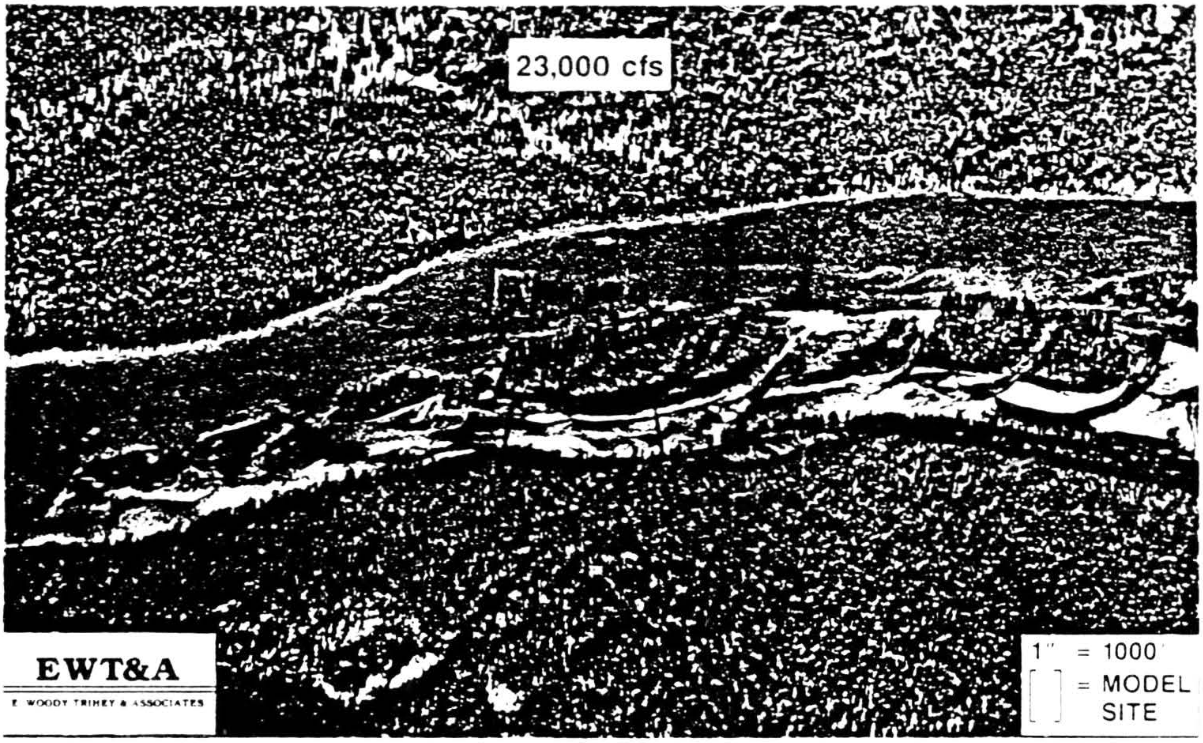


Plate A-12 Aerial photography of modeling site 132.6L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 10,500 cfs and is included in Representative Group III.



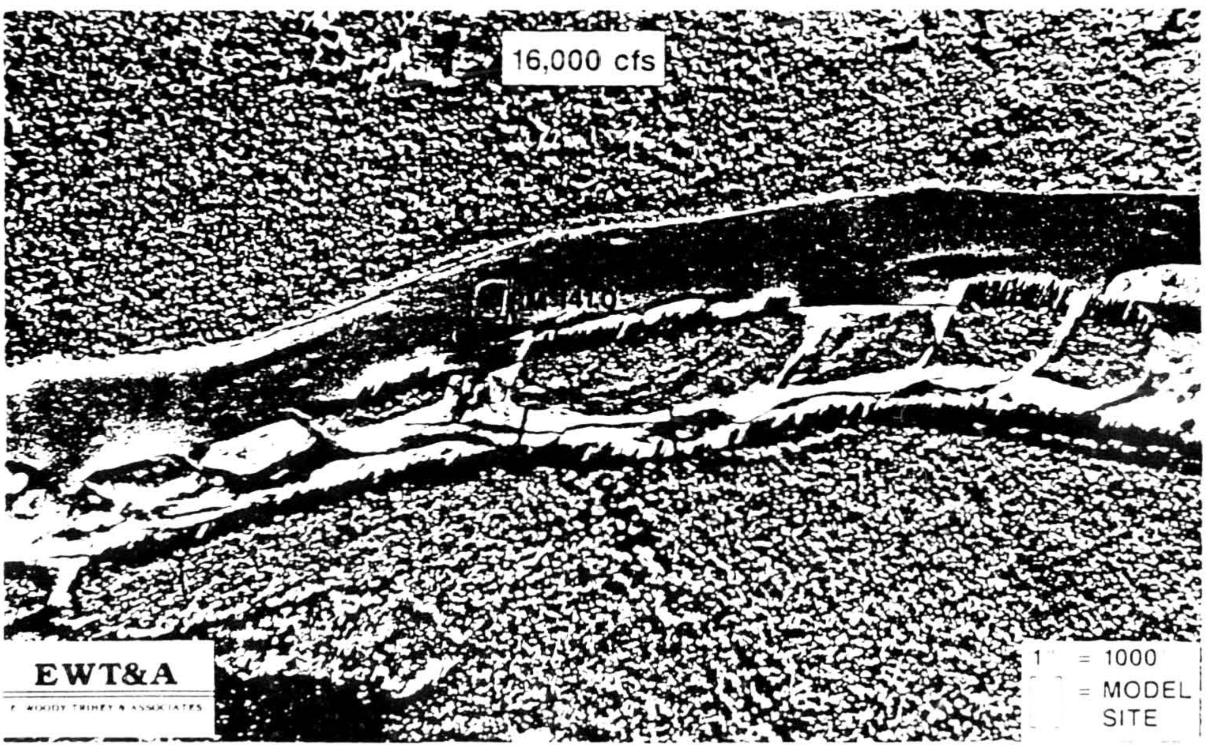
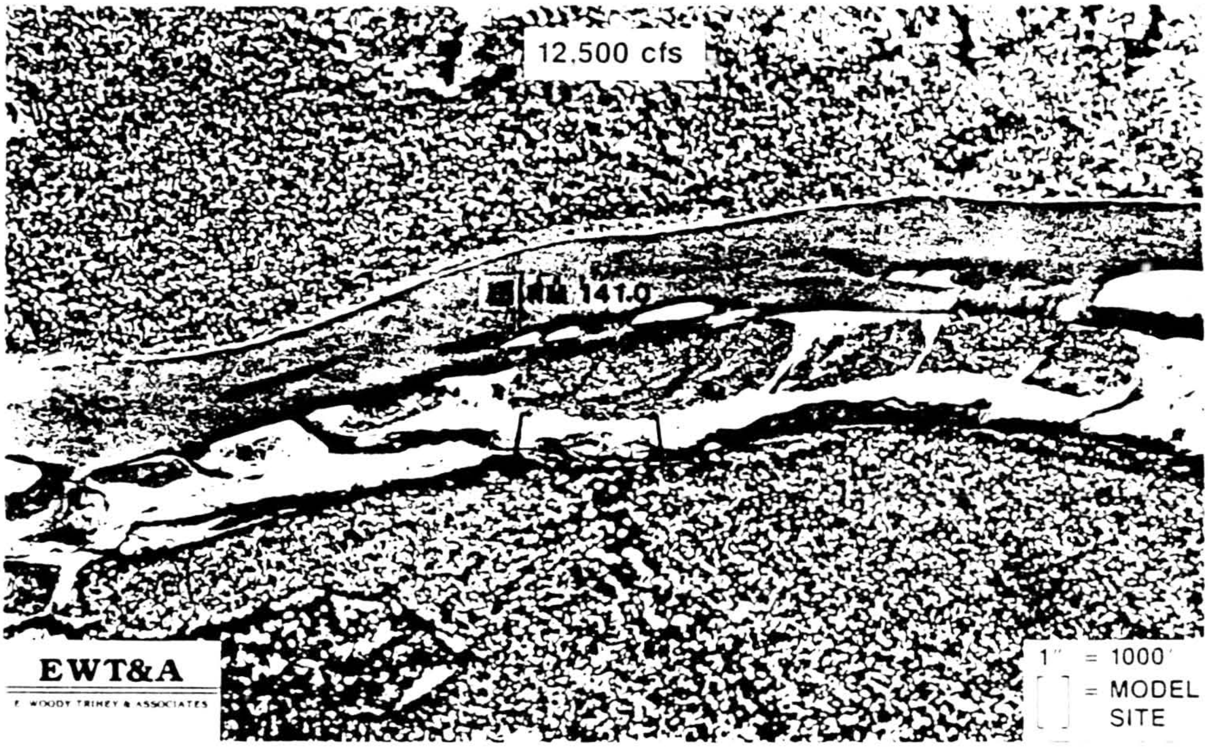


Plate A-13 Aerial photography of modeling site 141.4R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 11,500 cfs and is included in Representative Group III.



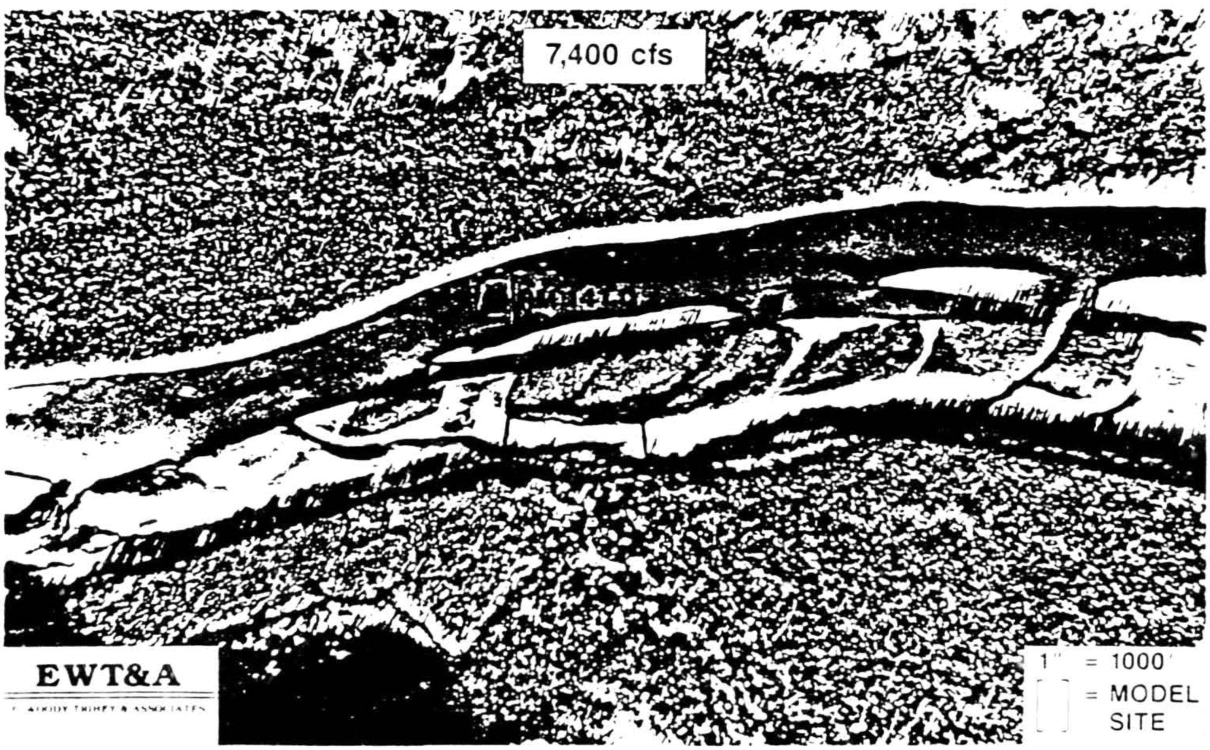
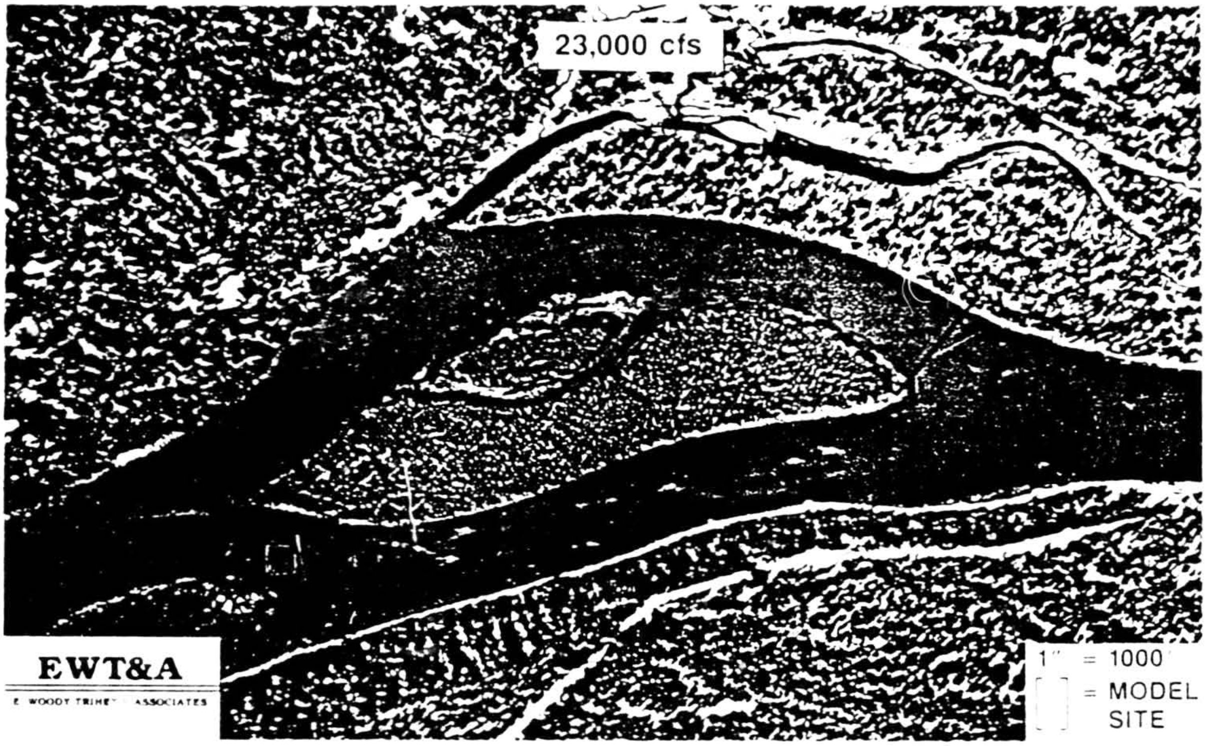


Plate A-14 Aerial photography of modeling site 141.4R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 11,500 cfs and is included in Representative Group III.



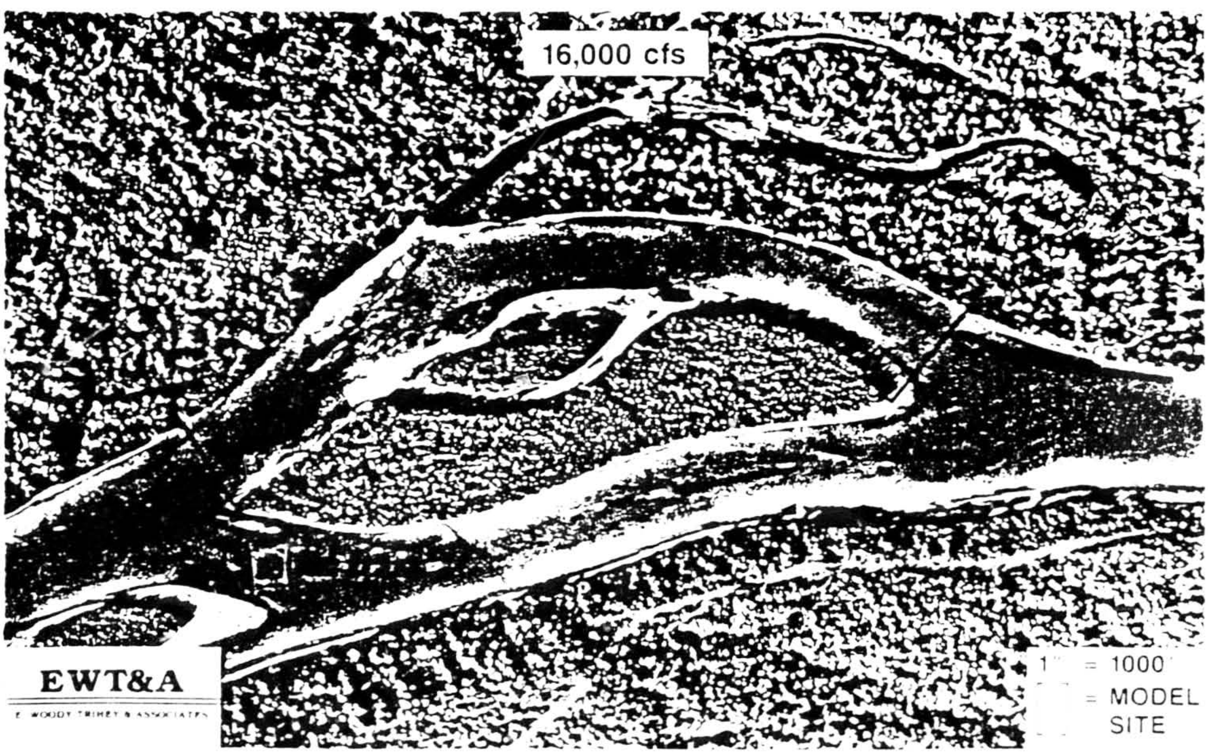
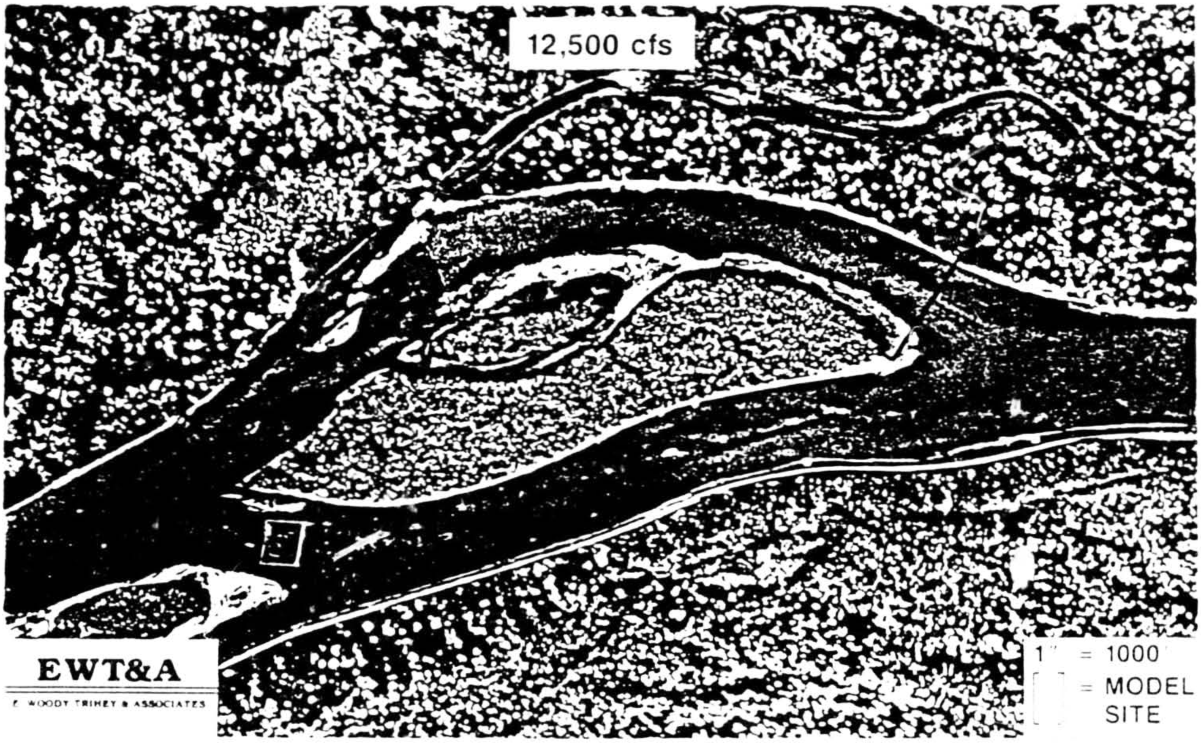


Plate A-15 Aerial photography of modeling site 112.6L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



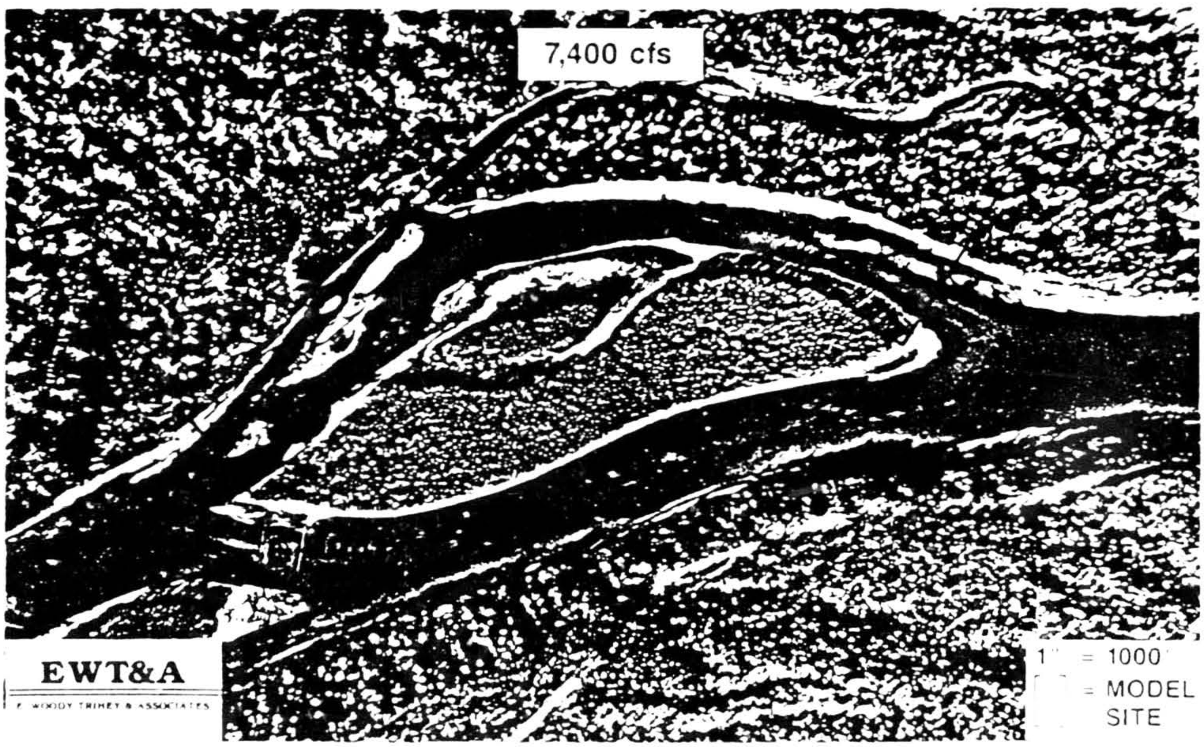
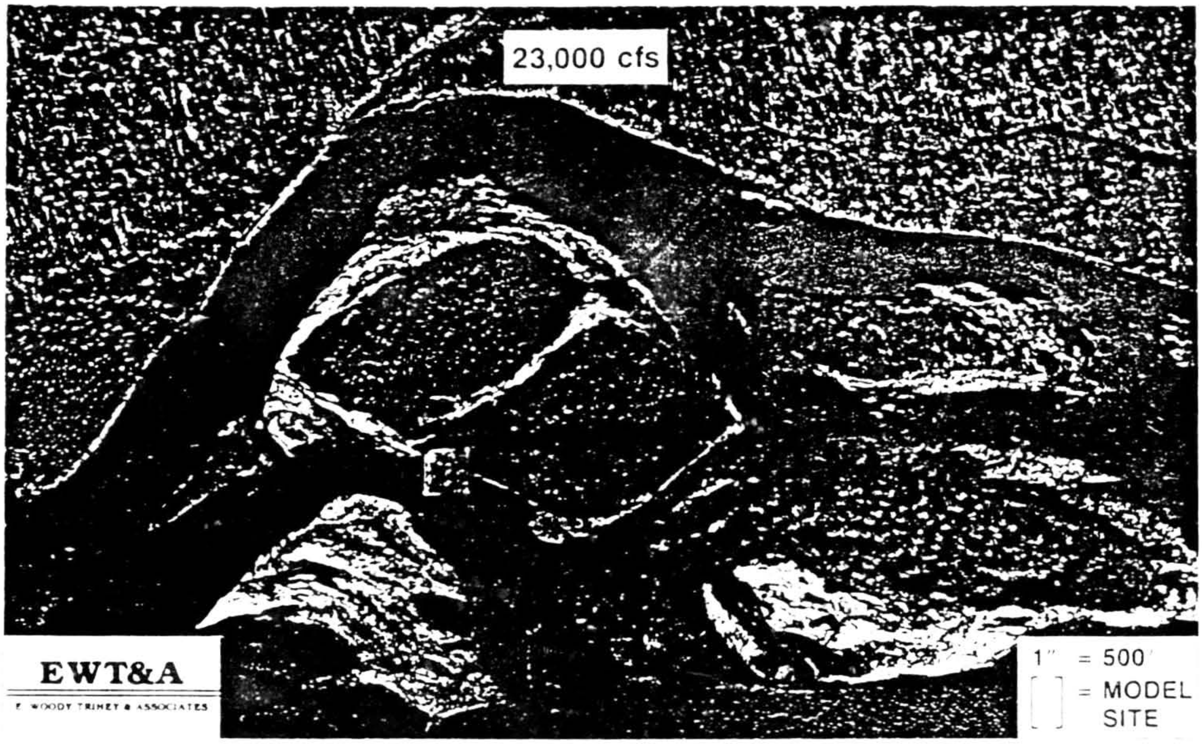


Plate A-16 Aerial photography of modeling site 112.6L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



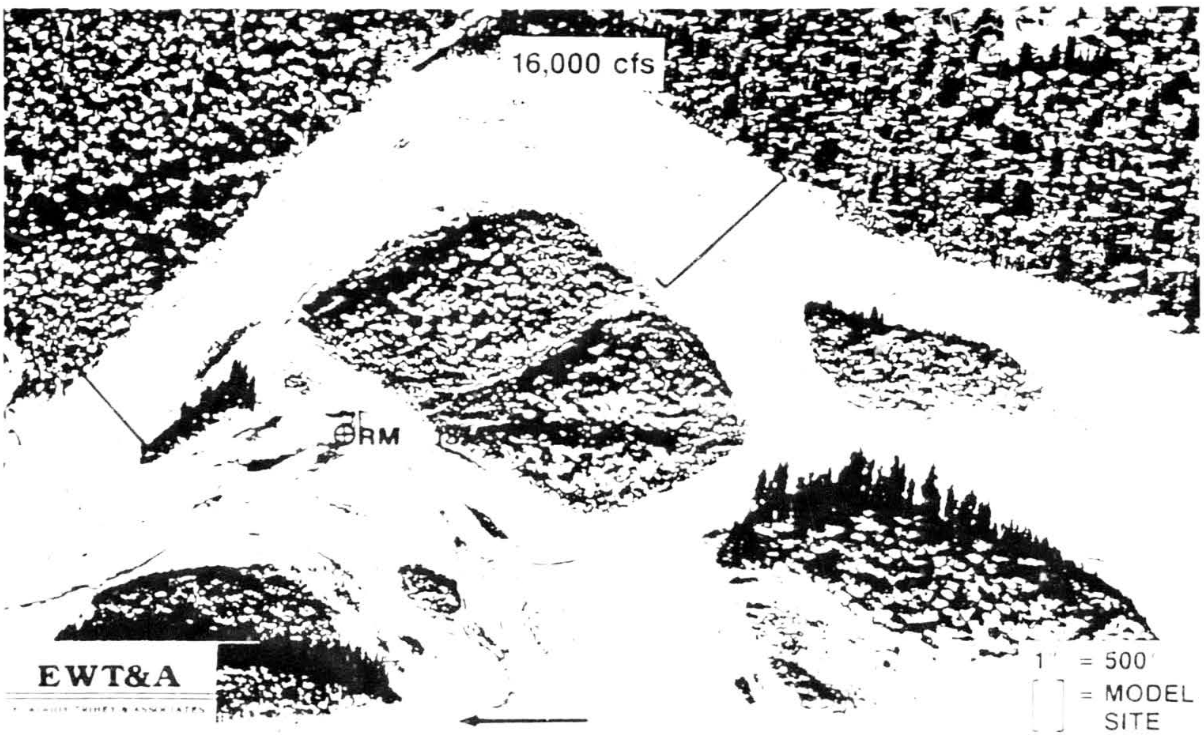
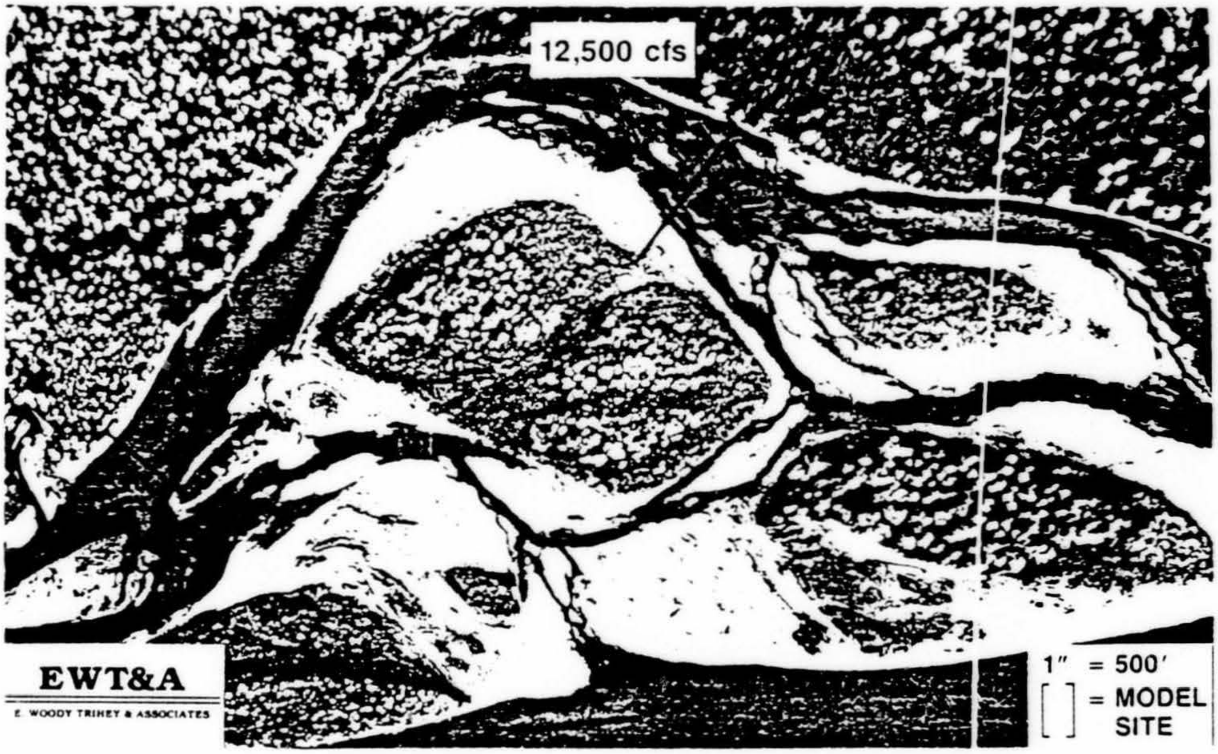


Plate A-17 Aerial photography of modeling site 131.7L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



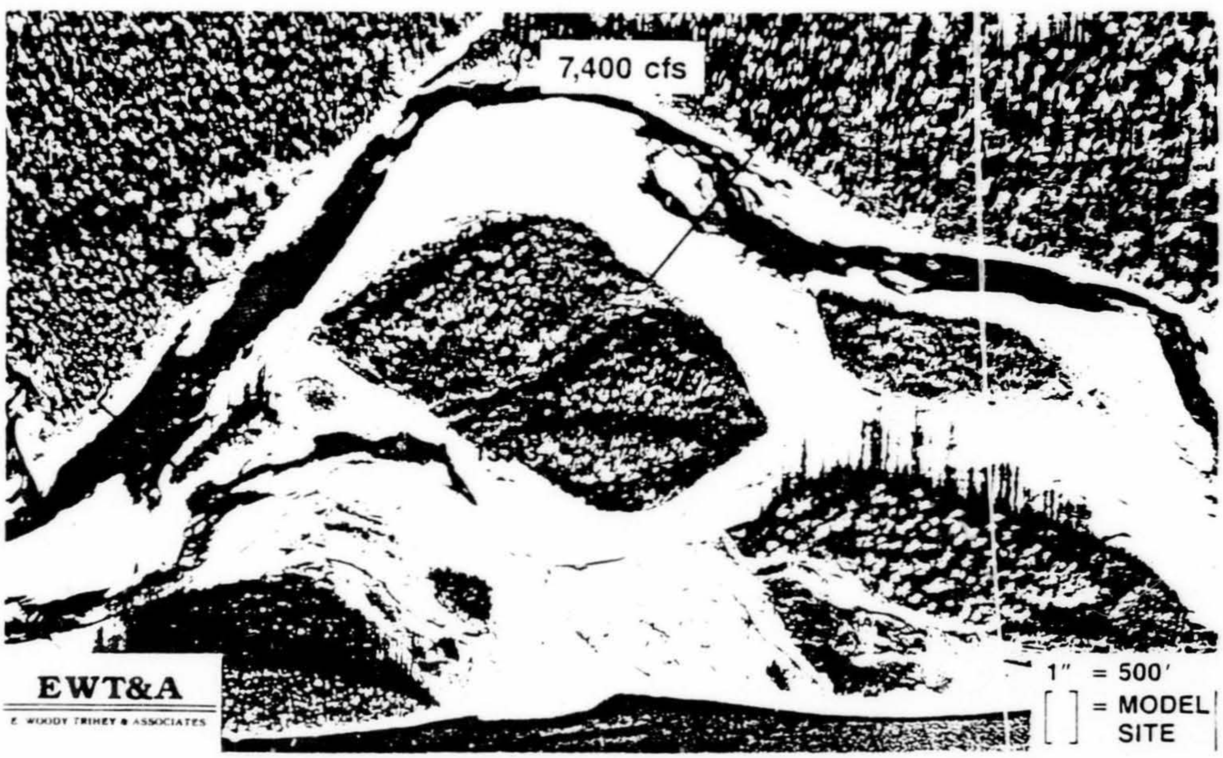
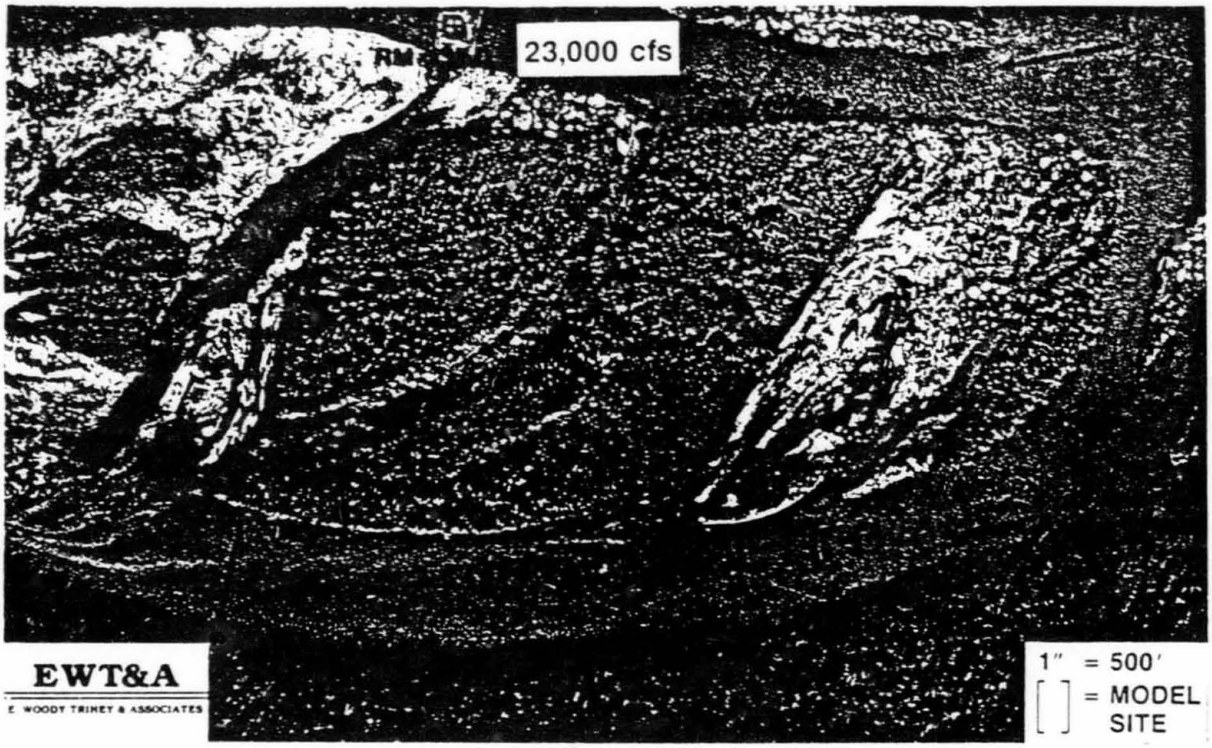


Plate A-18 Aerial photography of modeling site 131.7L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



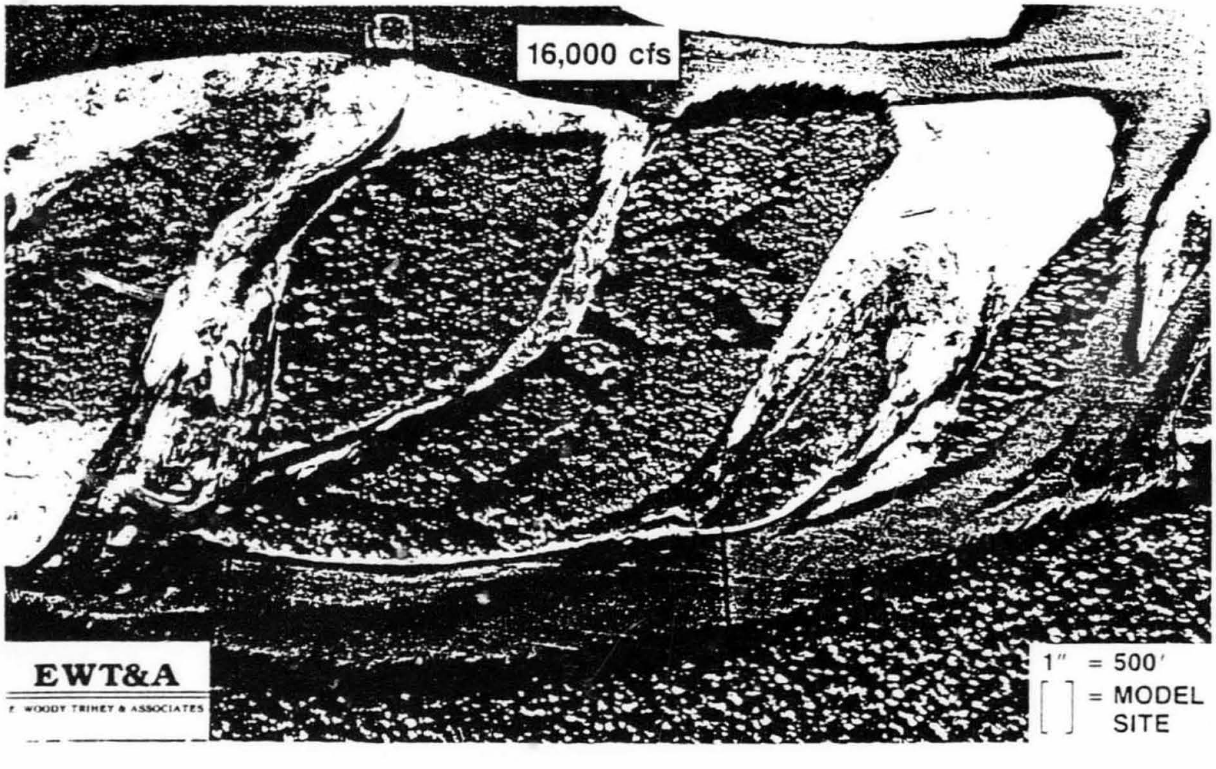
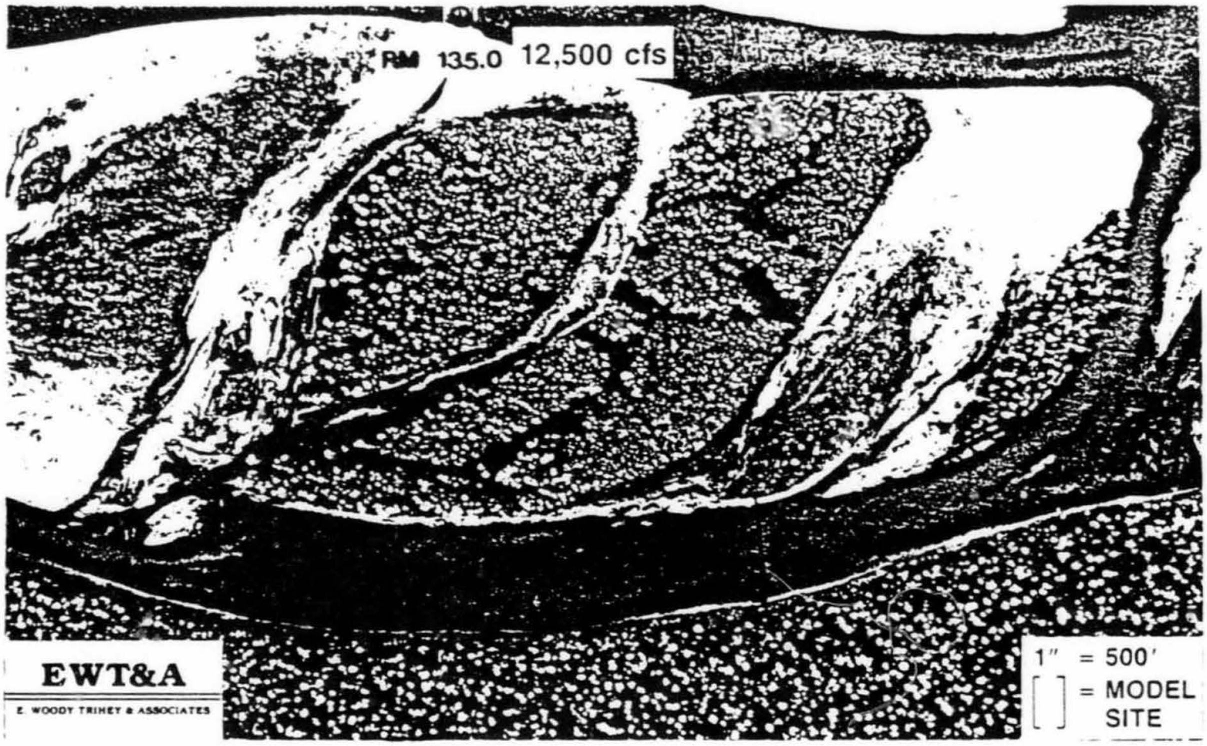


Plate A-19 Aerial photography of modeling site 134.9R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



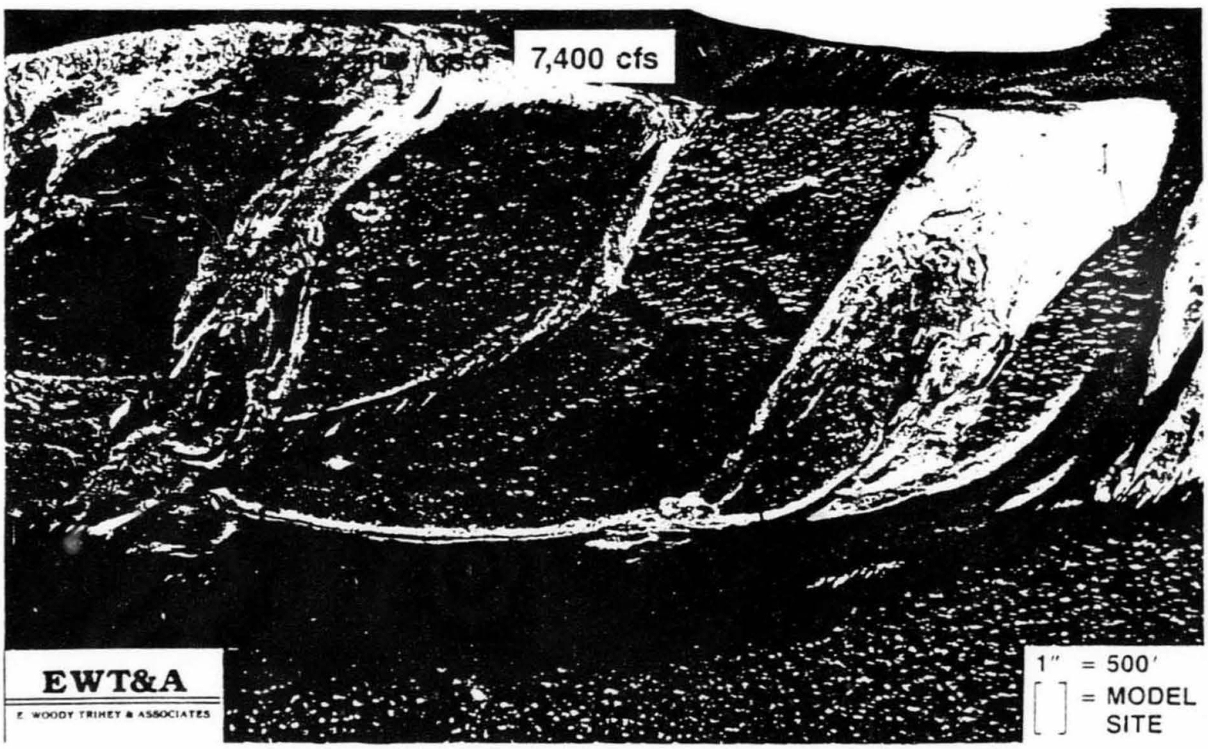
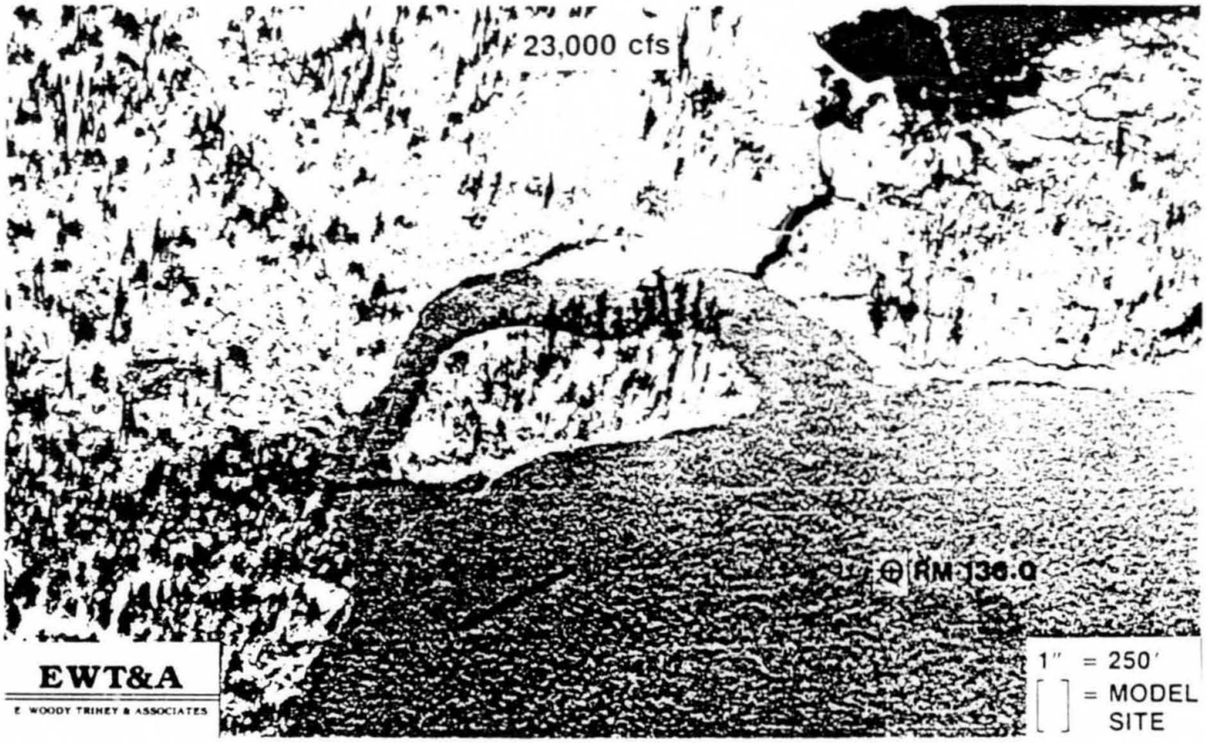


Plate A-20 Aerial photography of modeling site 134.9R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



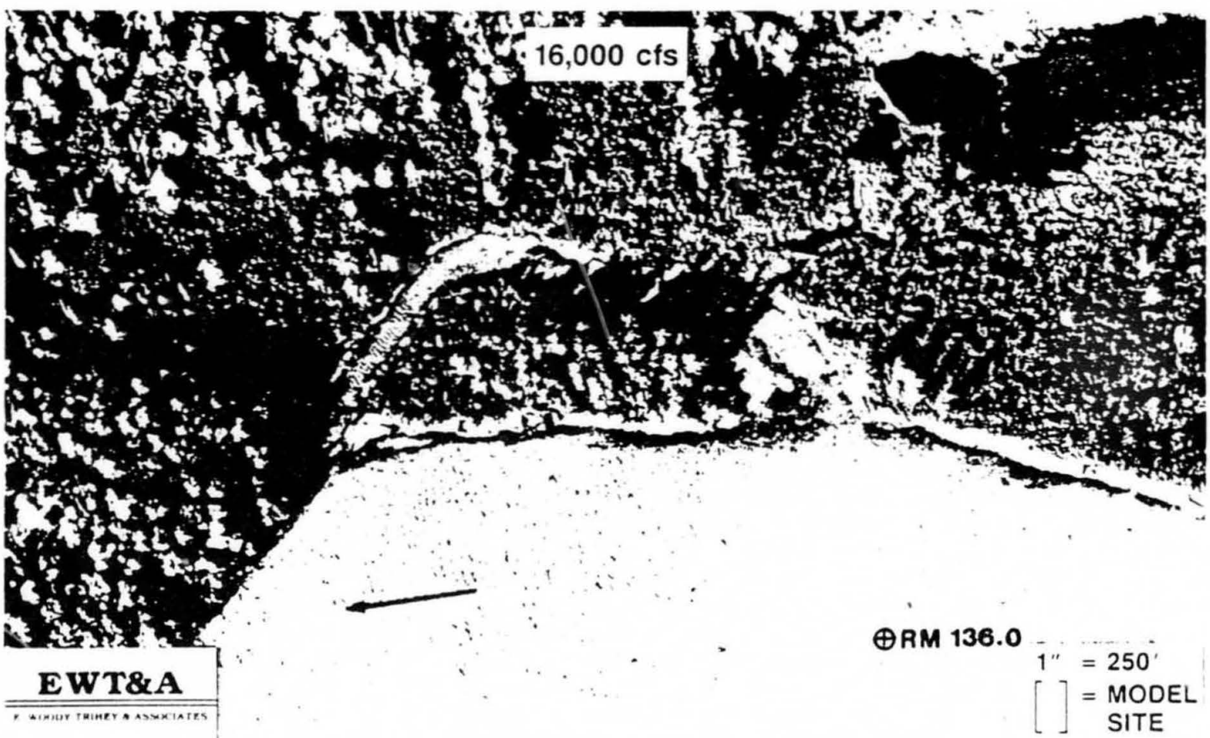
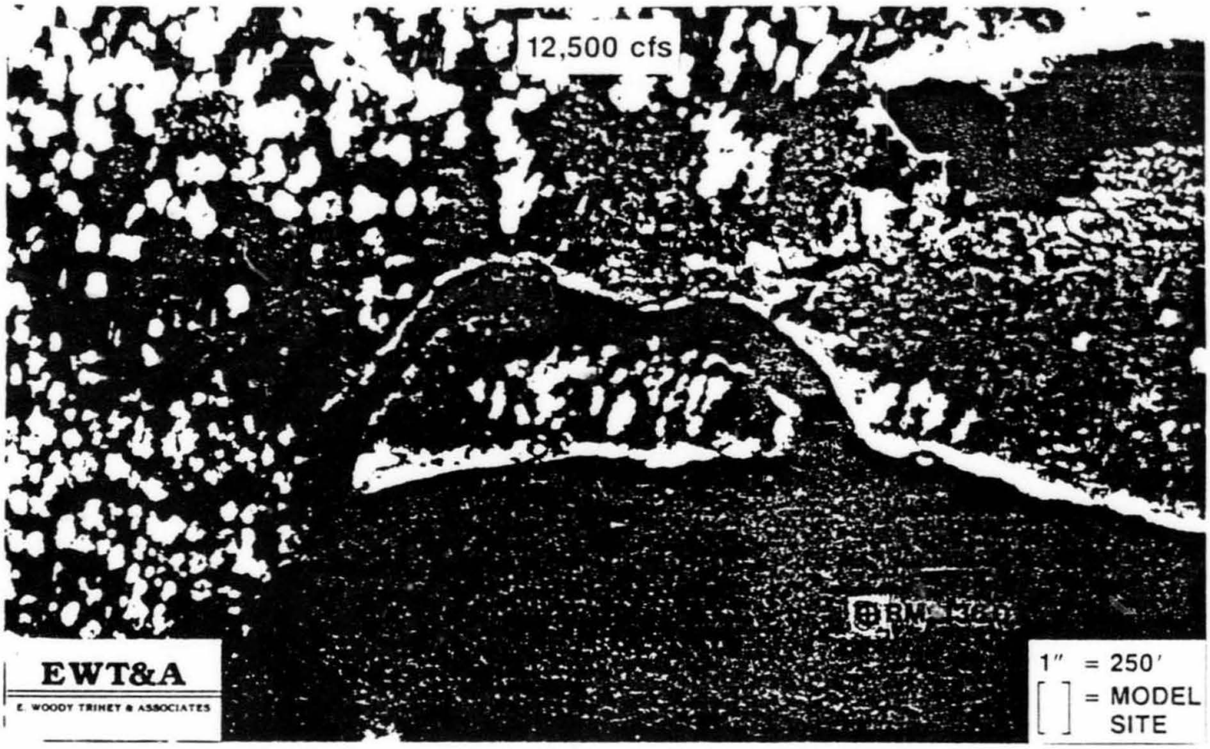


Plate A-21 Aerial photography of modeling site 136.0L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



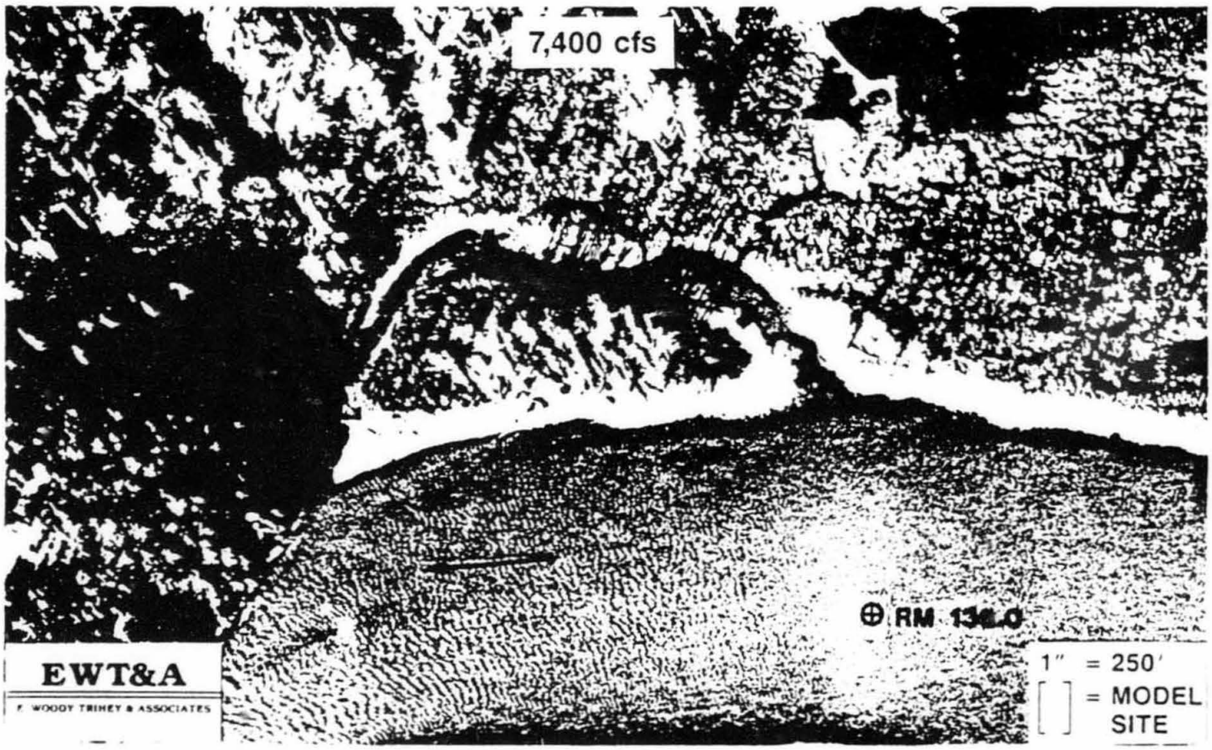
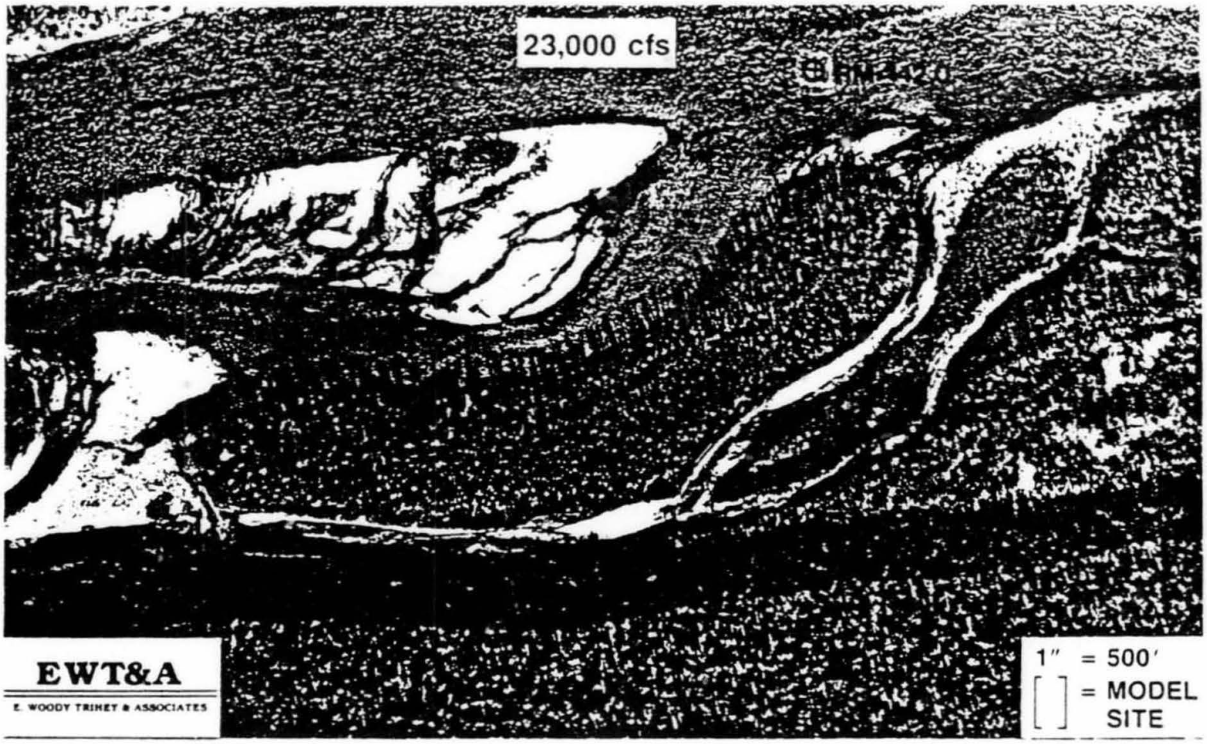


Plate A-22 Aerial photography of modeling site 136.0L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Representative Group IV.



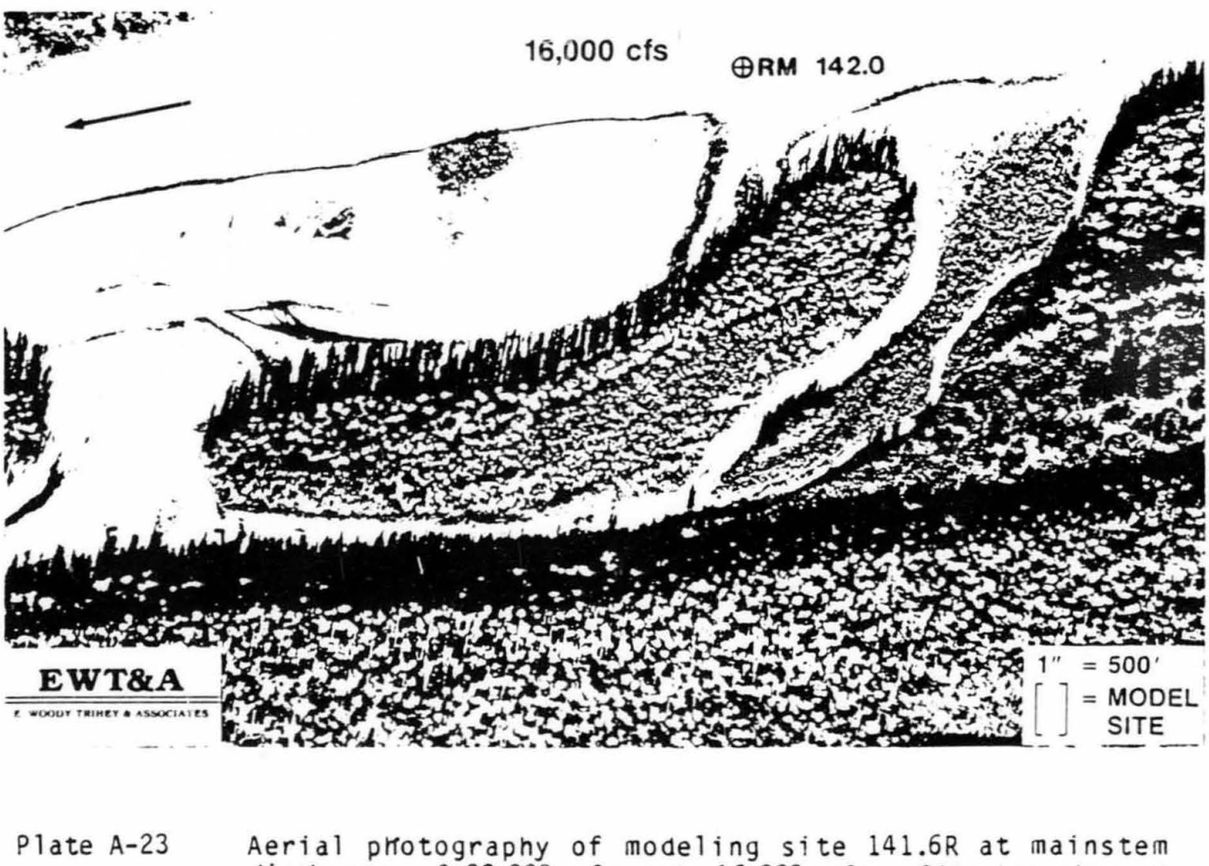
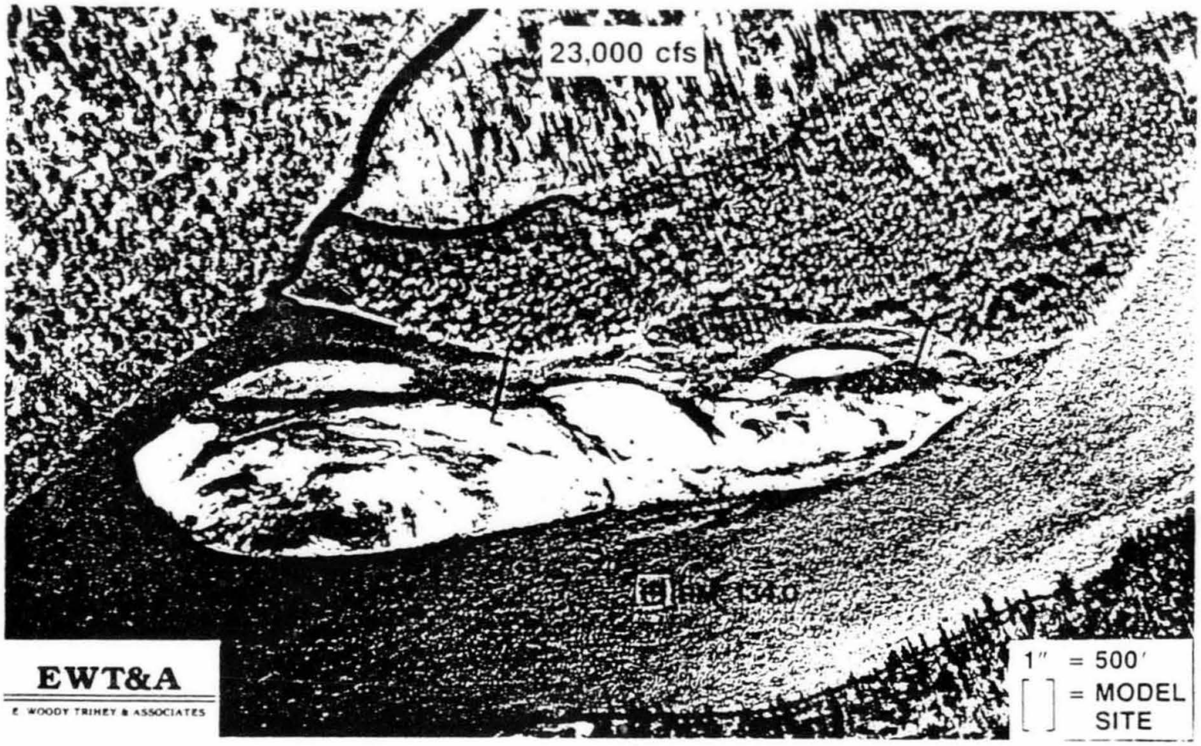


Plate A-23 Aerial photography of modeling site 141.6R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 21,000 cfs and is included in Representative Group V.



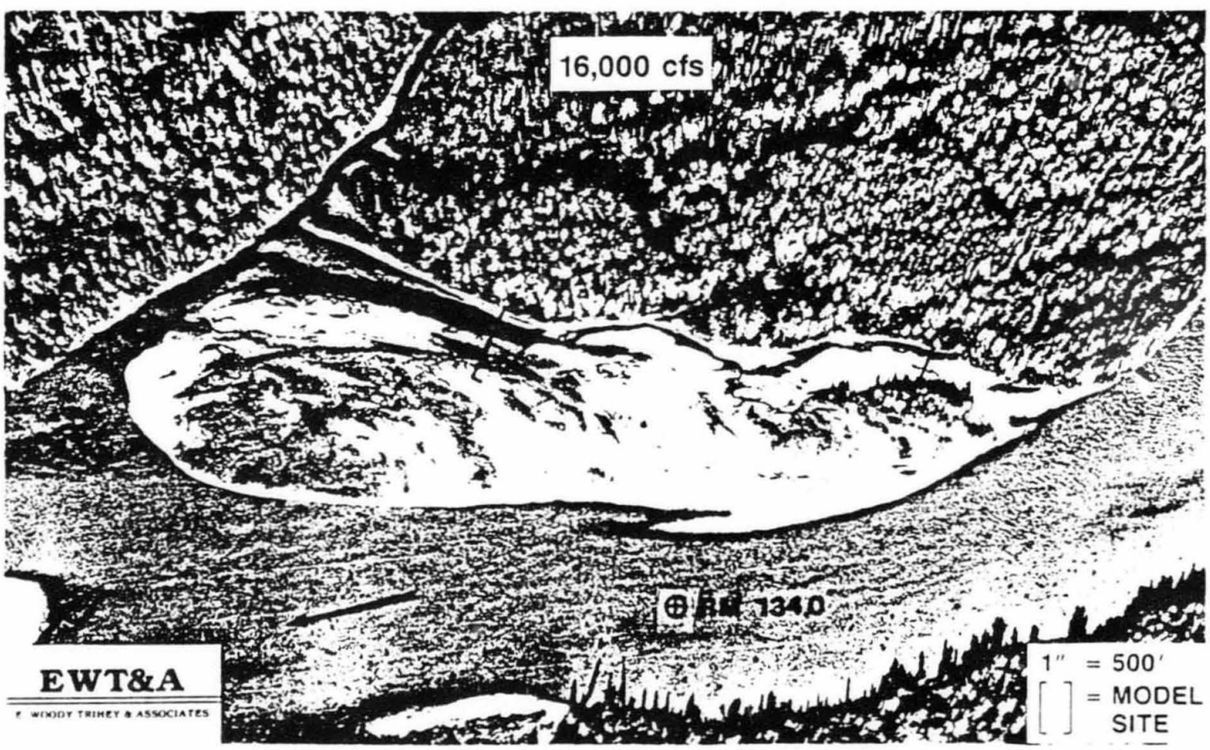
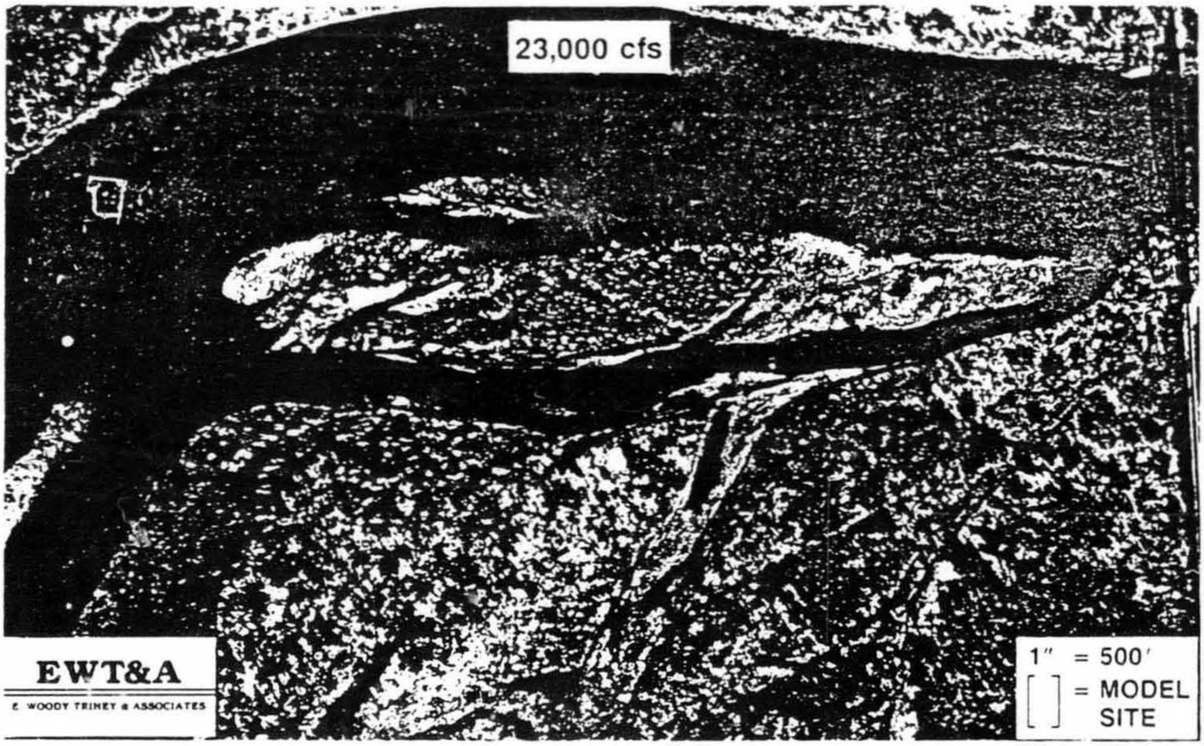


Plate A-24 Aerial photography of modeling site 133.8L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 17,500 cfs and is included in Representative Group VI.



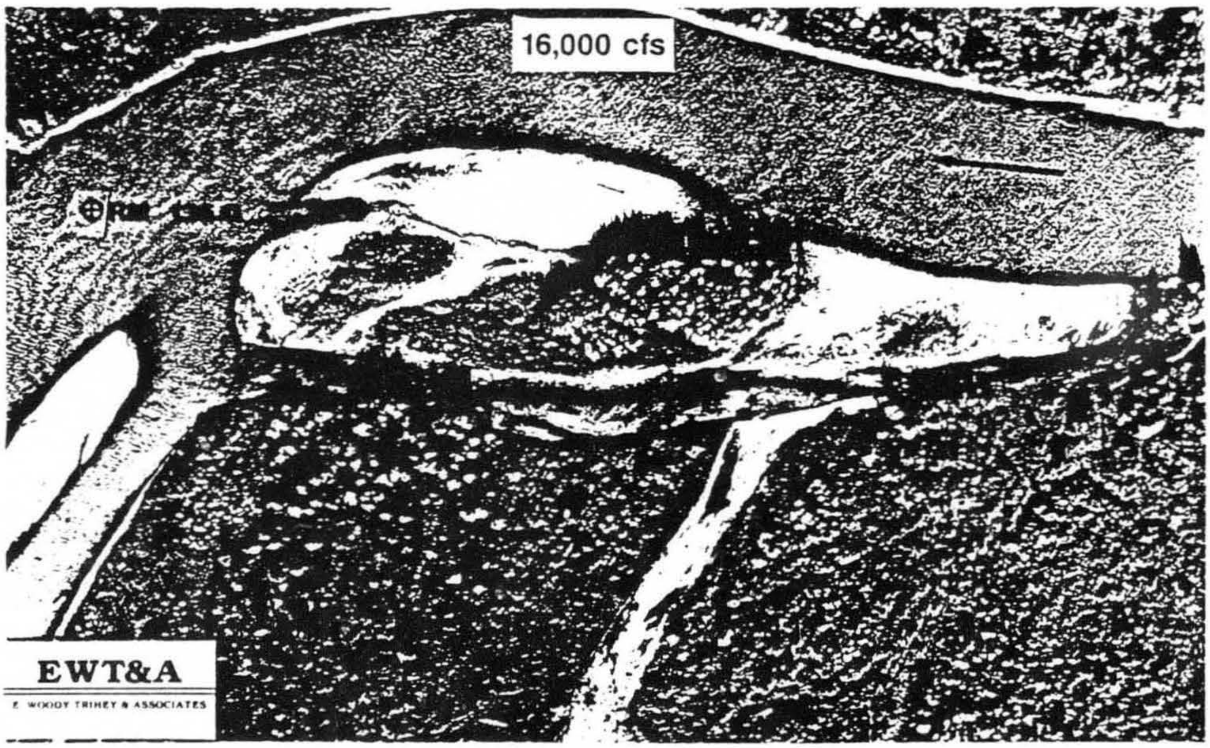
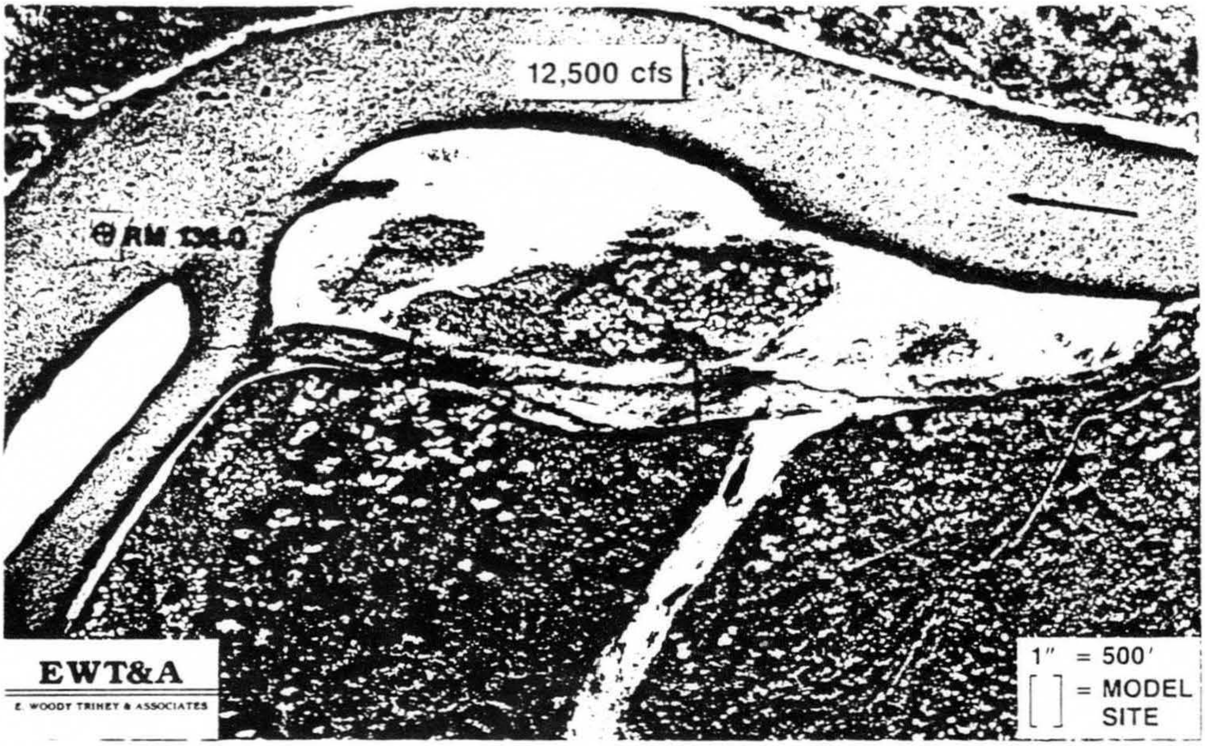


Plate A-25 Aerial photography of modeling site 136.3R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 13,000 cfs and is included in Representative Group VI.



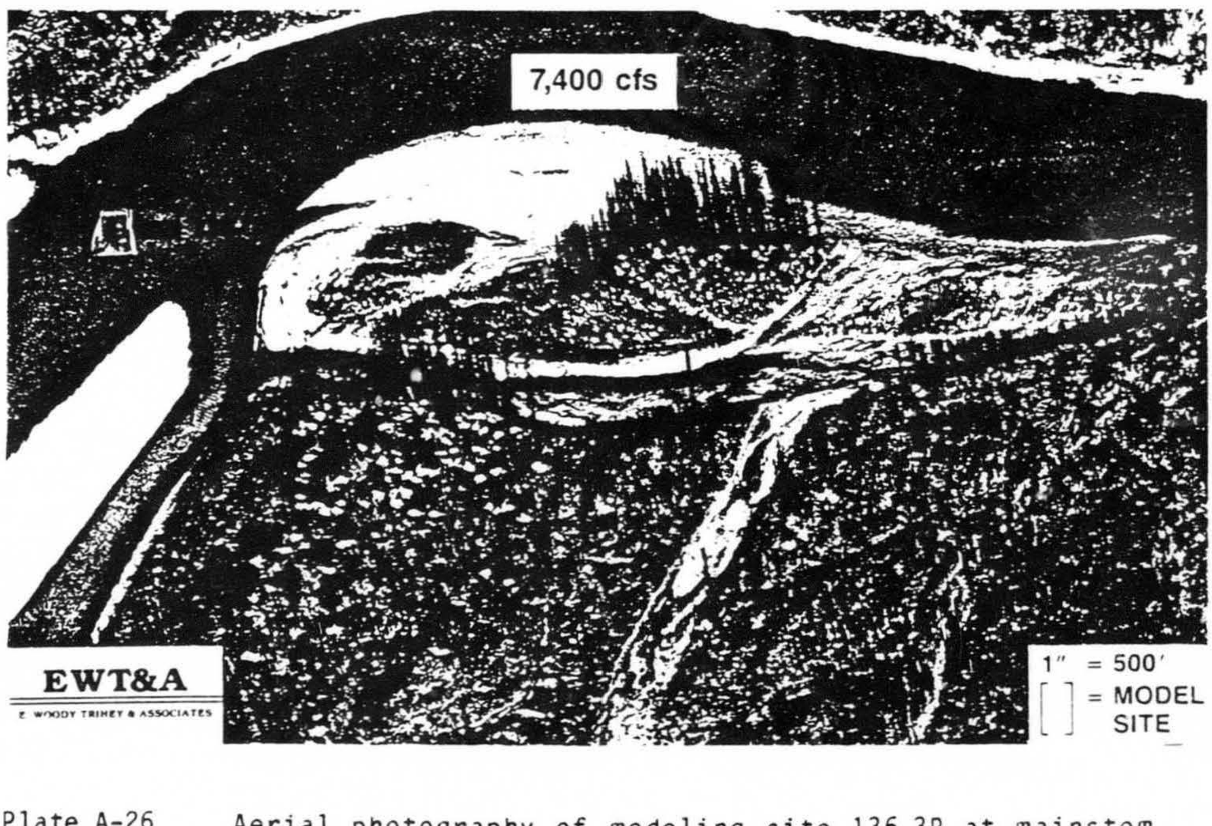
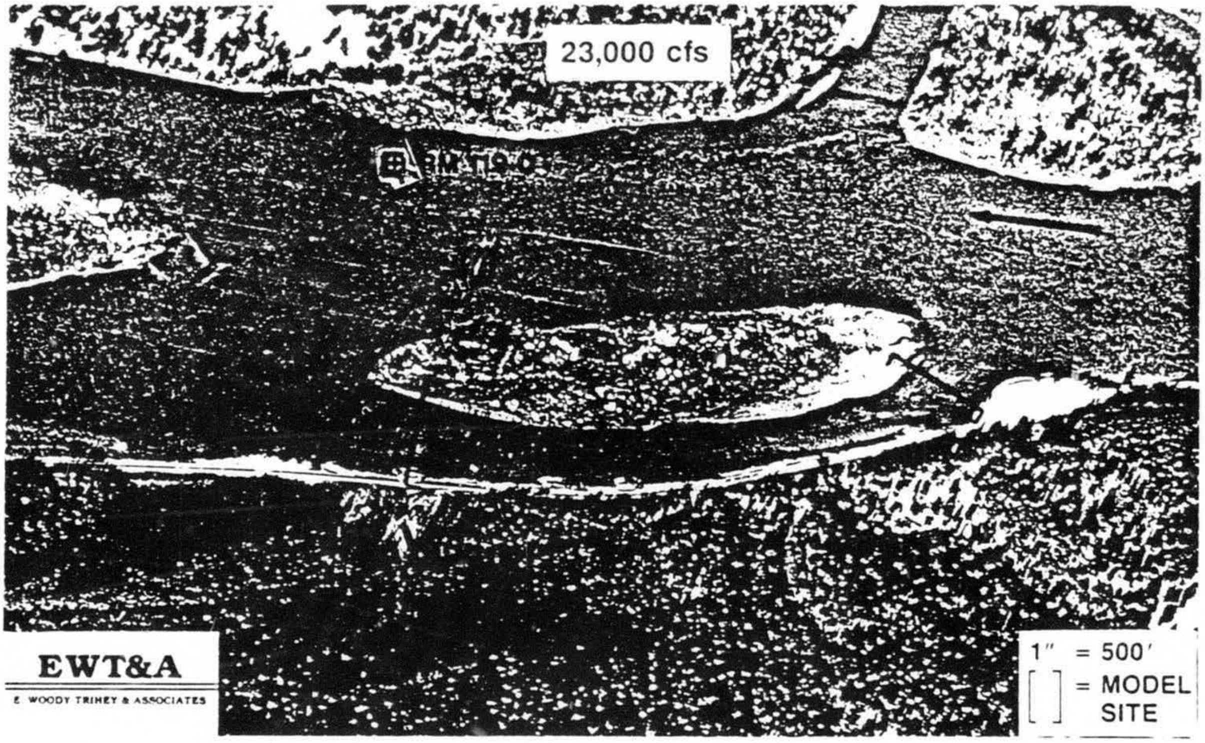


Plate A-26 Aerial photography of modeling site 136.3R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 13,000 cfs and is included in Representative Group VI.



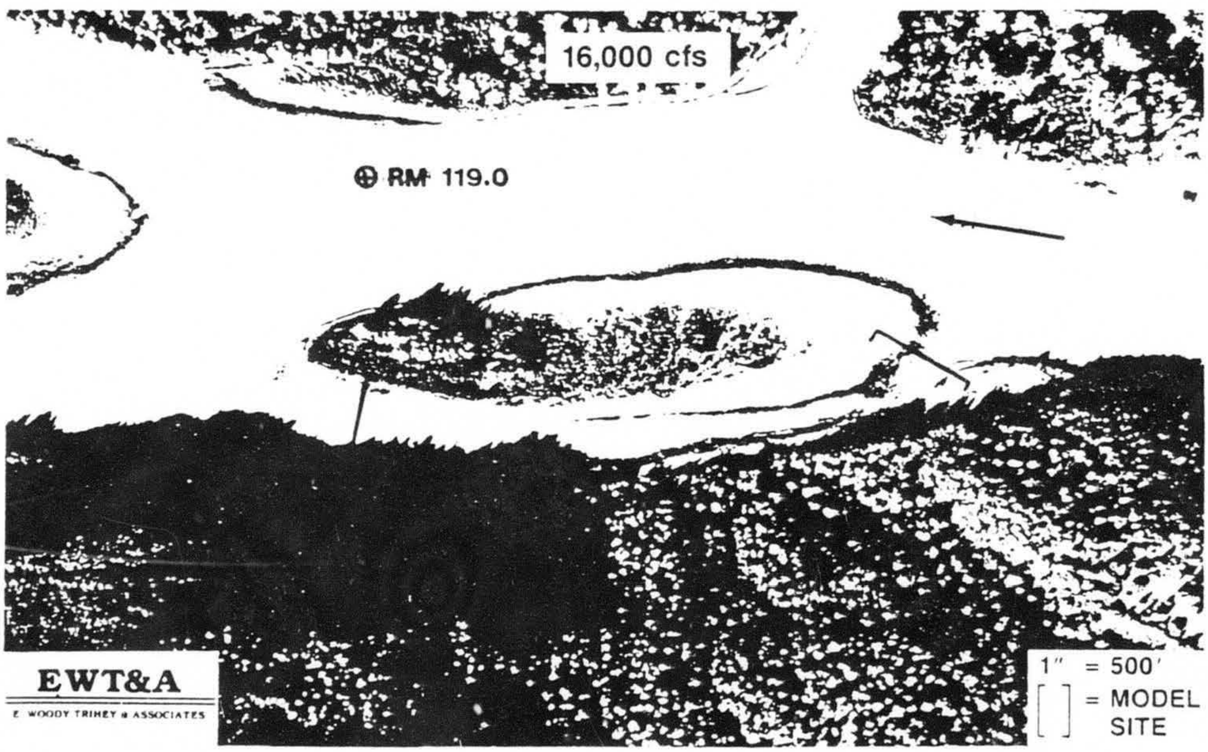
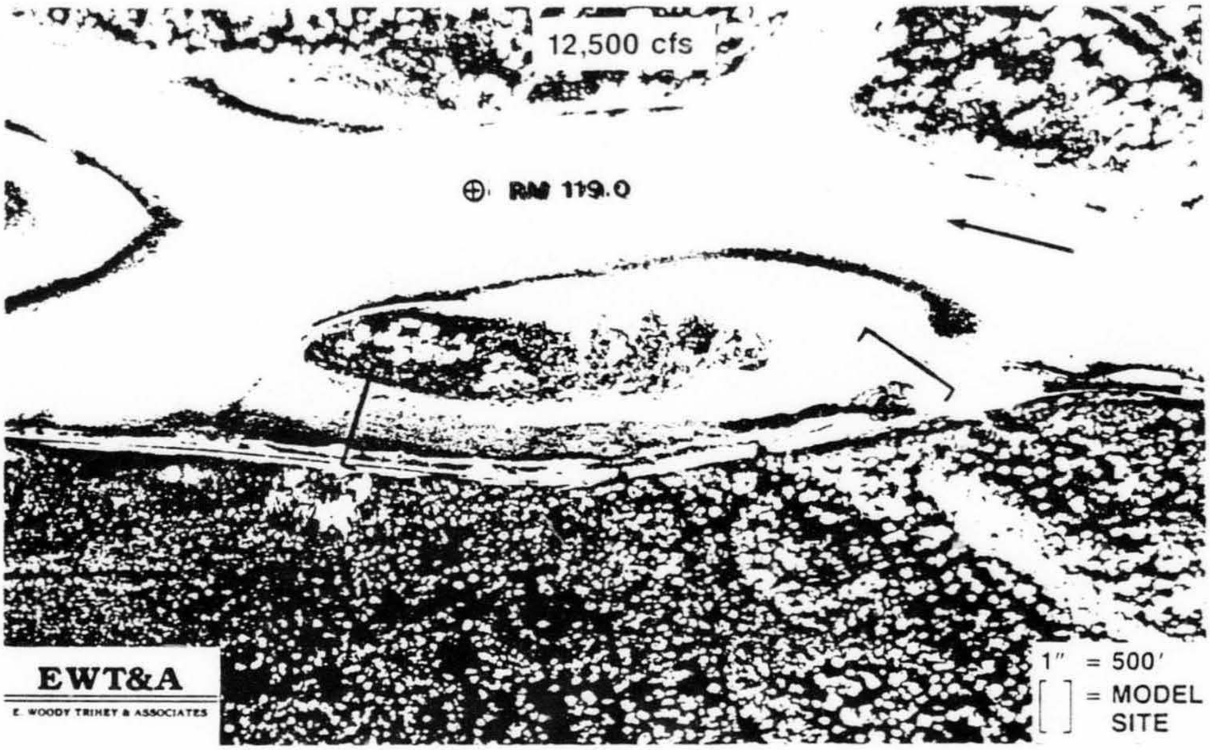


Plate A-27 Aerial photography of modeling site 119.2R at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at 10,000 cfs and is included in Representative Group VII.



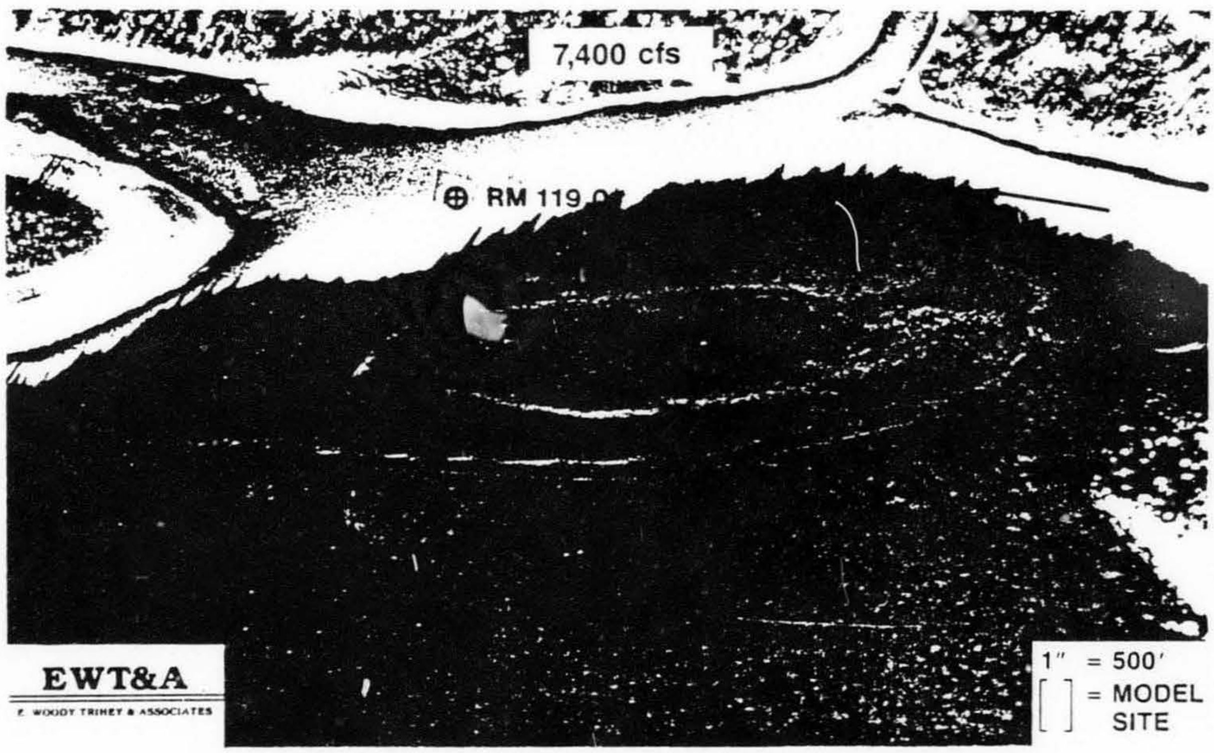
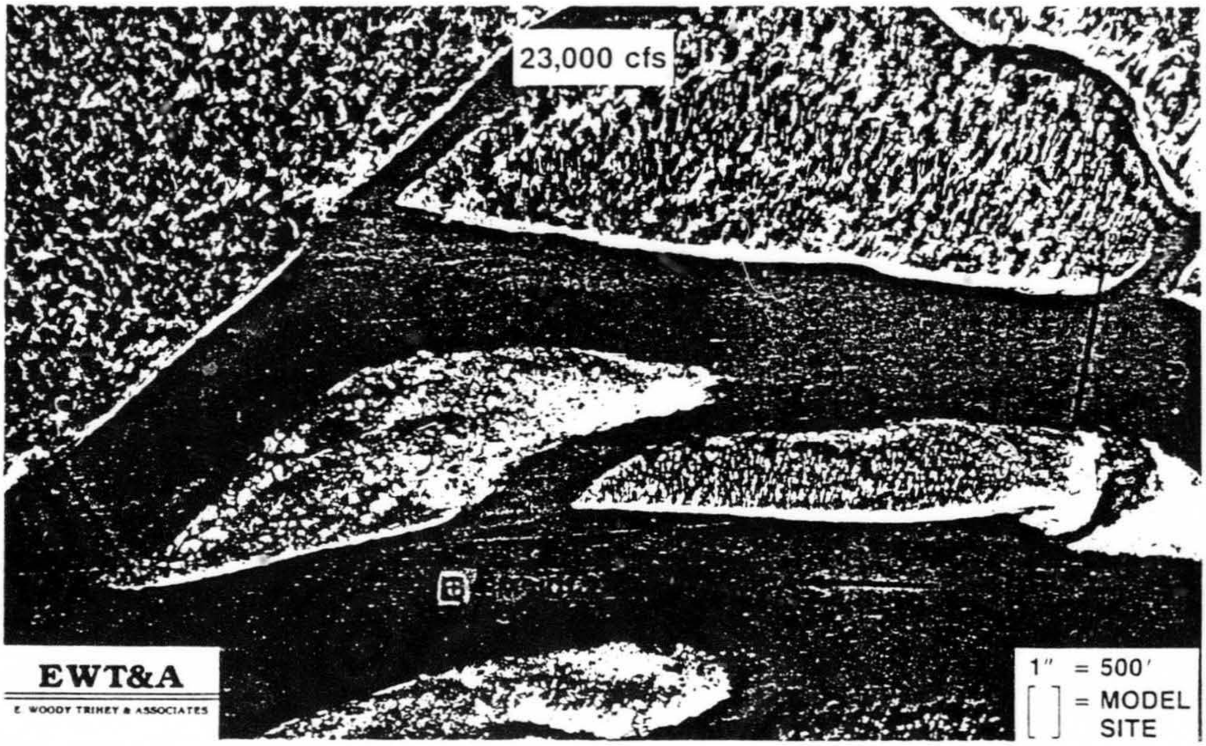


Plate A-28 Aerial photography of modeling site 119.2R at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at 10,000 cfs and is included in Representative Group VII.



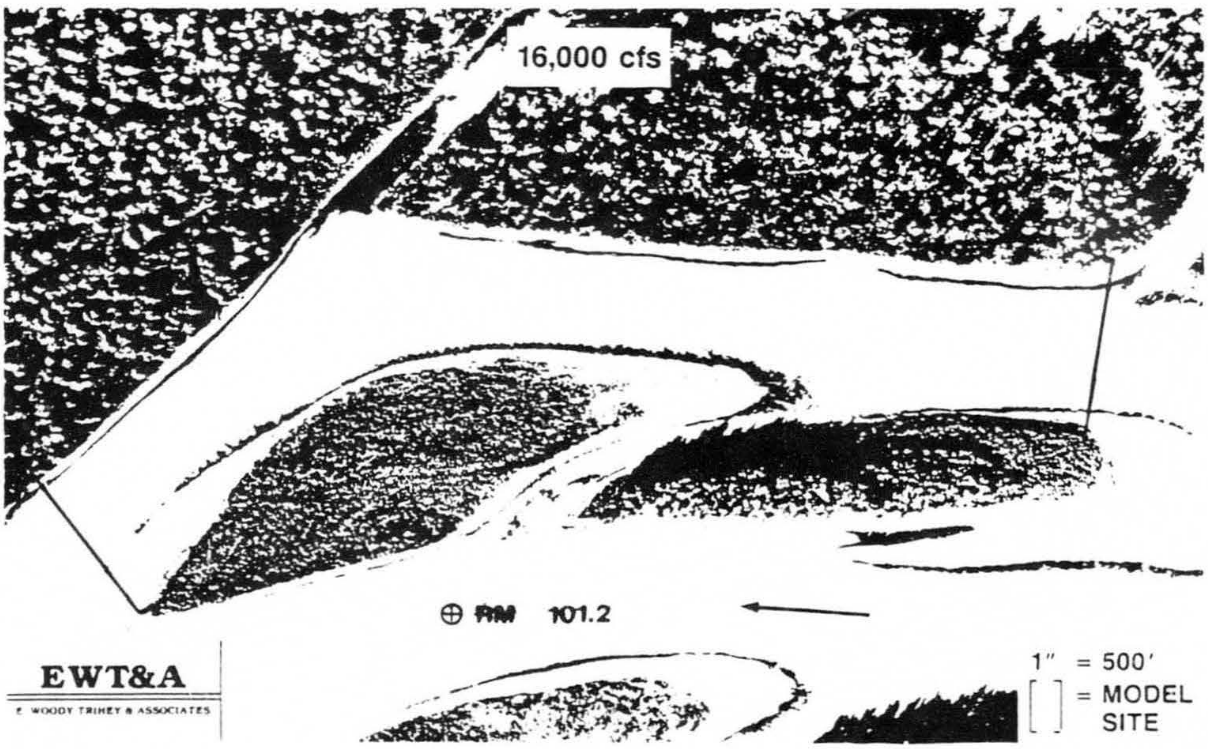
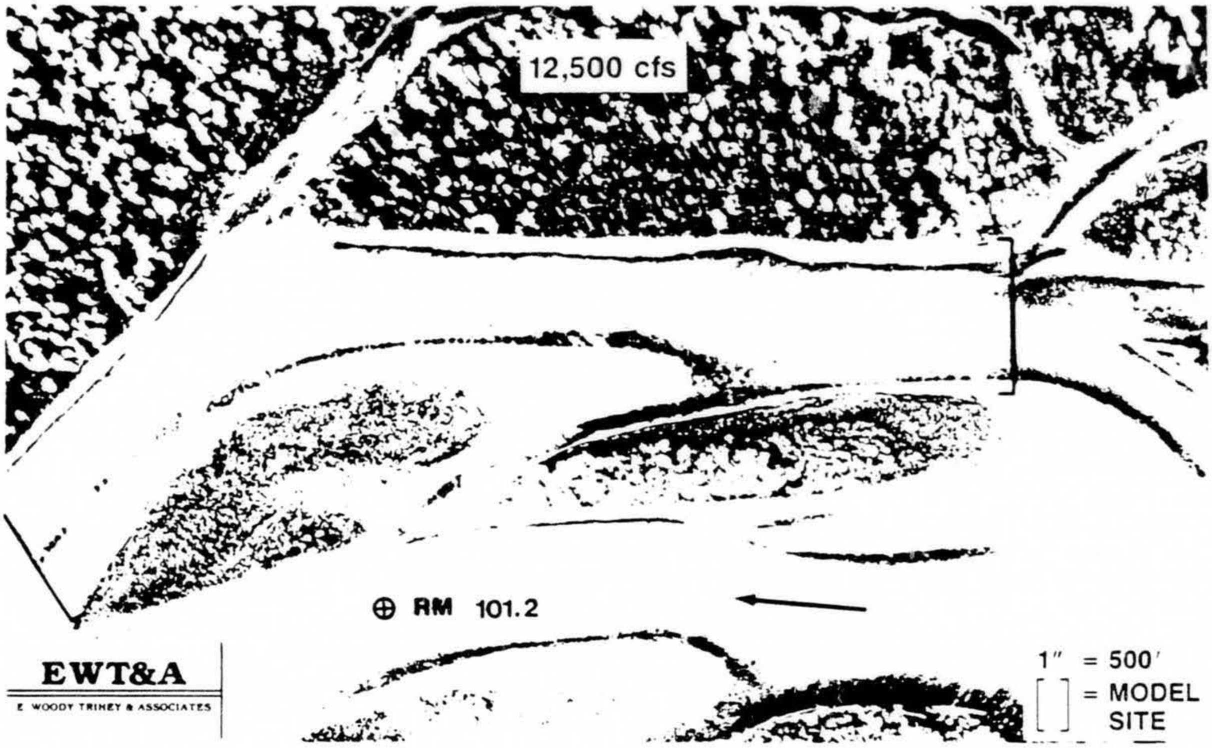


Plate A-29 Aerial photography of modeling site 101.5L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IX.



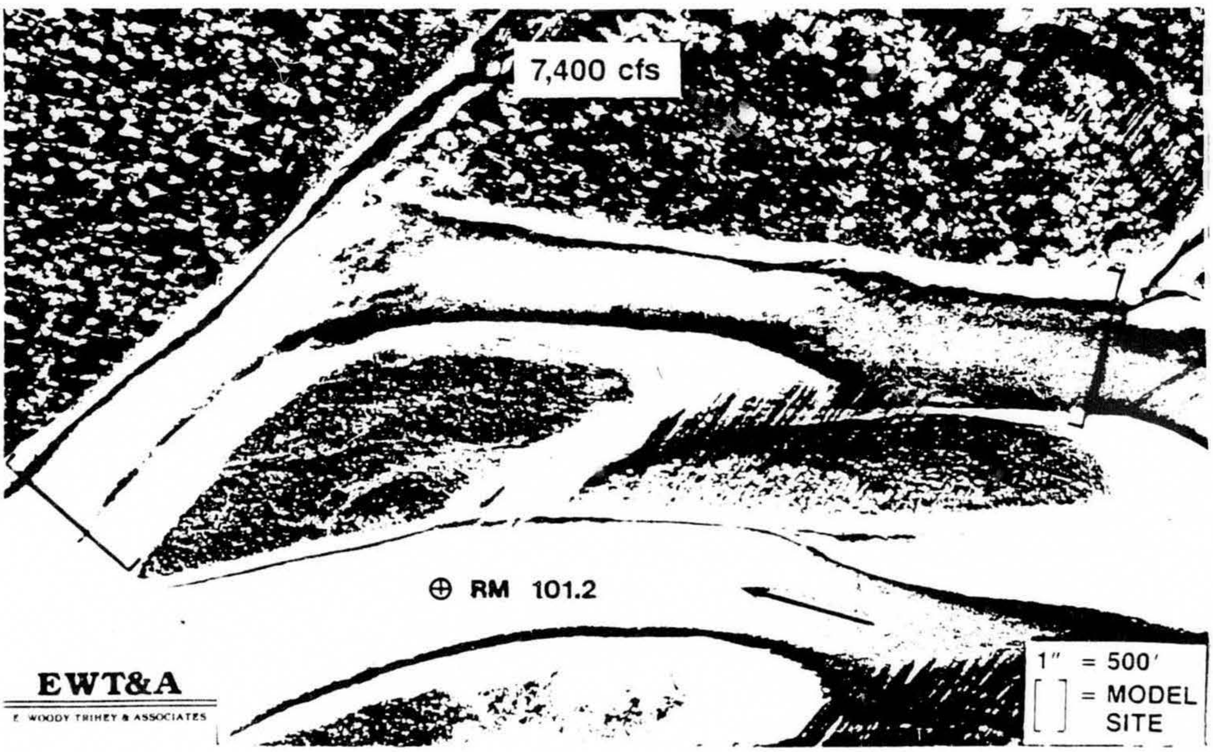
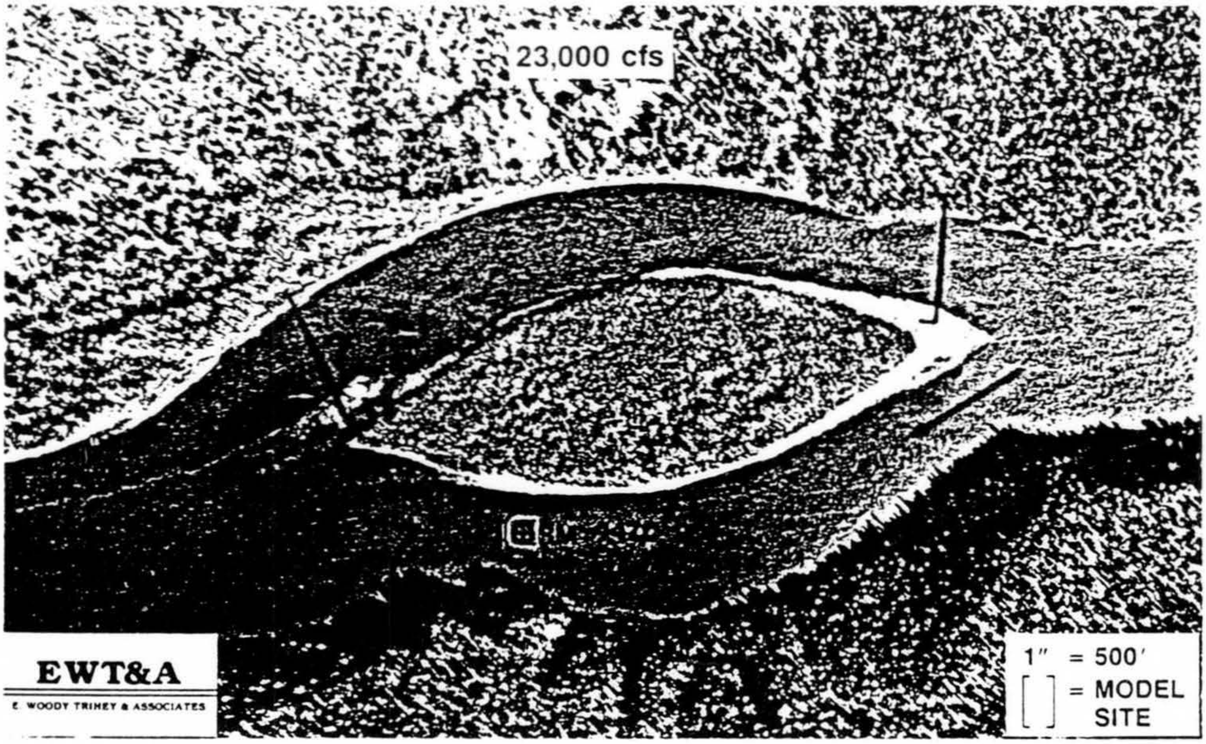


Plate A-30 Aerial photography of modeling site 101.5L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Representative Group IX.



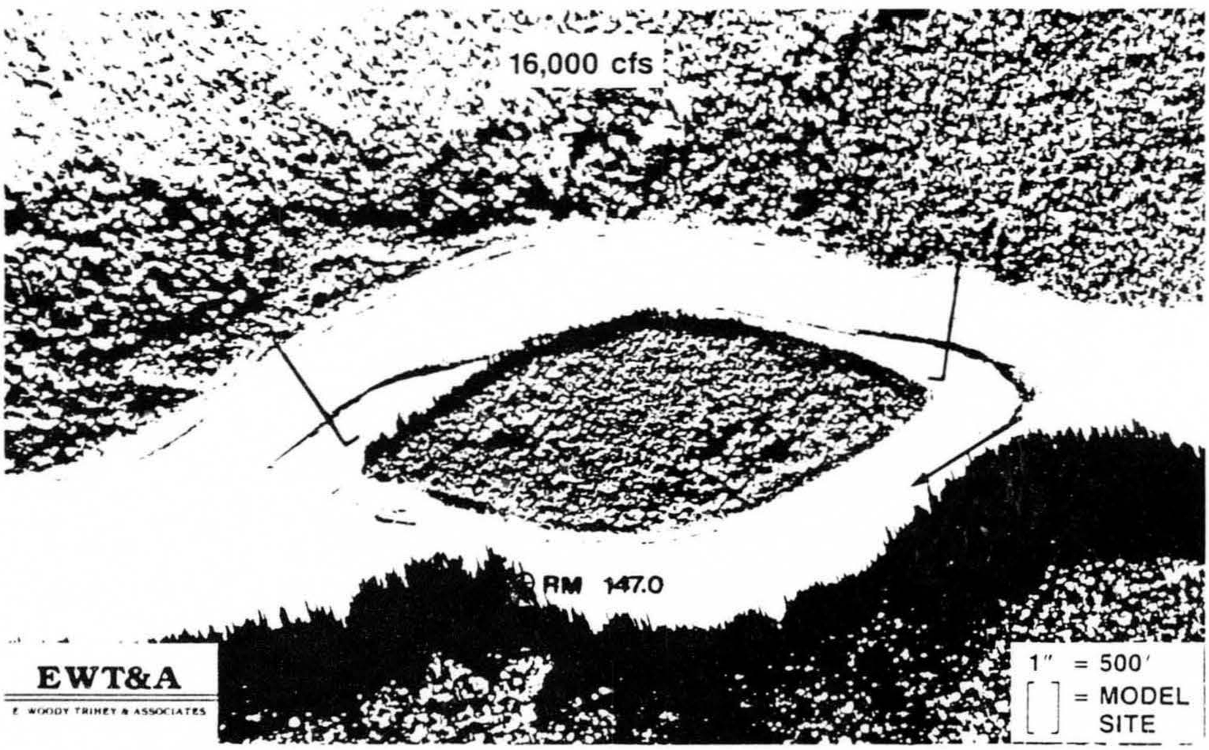
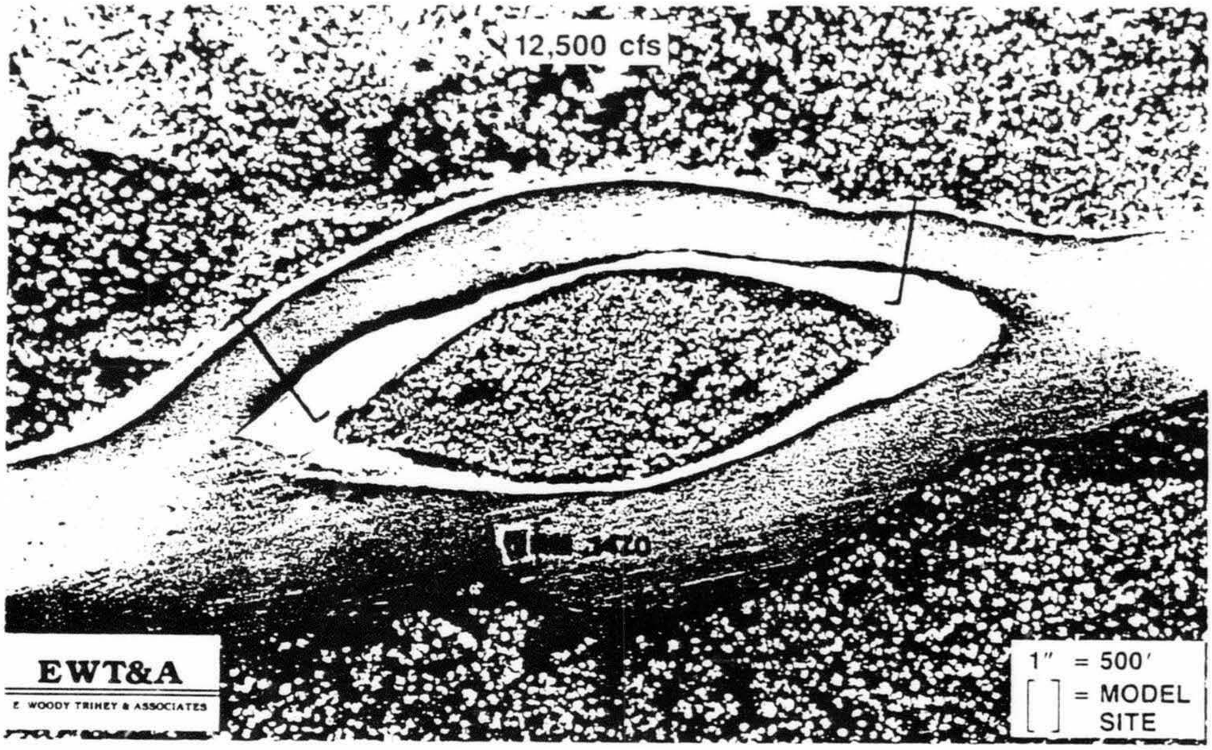


Plate A-31 Aerial photography of modeling site 147.1L at mainstem discharges of 23,000 cfs and 16,000 cfs. Site breaches at <5,000 cfs and is included in Representative Group IX.



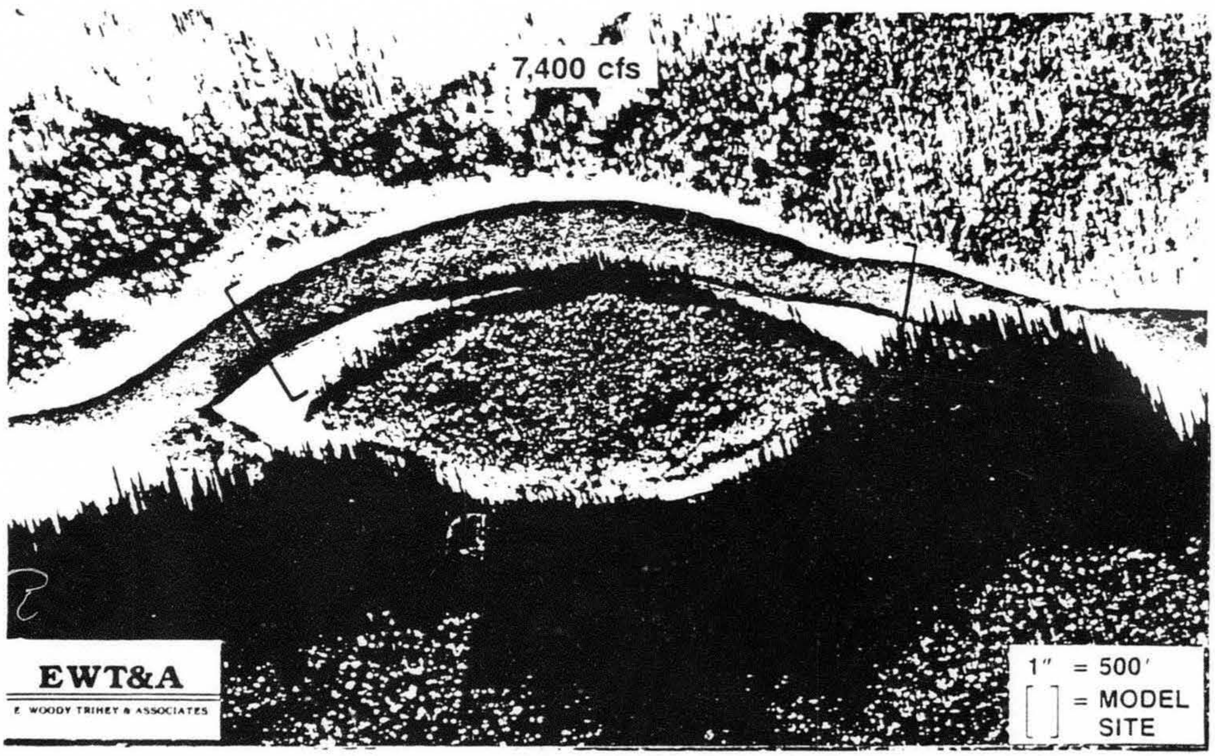


Plate A-32 Aerial photography of modeling site 147.1L at mainstem discharges of 12,500 cfs and 7,400 cfs. Site breaches at <5,000 cfs and is included in Rerresentative Group IX.

APPENDIX B

HABITAT AVAILABILITY INDICES (HAI) FOR SPECIFIC AREAS

REPRESENTATIVE GROUP 1
HAI VALUES (PERCENT)

Qms	102.2L	105.2R	107.6L	108.3L	112.5L	119.4L	120.0R	121.9R	123.1R	123.3R	127.2M	129.4R	133.9L	134.0L
5000	5.09	4.23	11.88	4.29	4.17	12.14	13.49	4.48	12.14	4.11	3.56	11.88	4.11	5.46
5500	5.09	4.23	11.87	4.29	4.17	12.14	13.48	4.48	12.14	4.11	3.56	11.87	4.11	5.46
6000	5.09	4.23	11.85	4.29	4.17	12.12	13.46	4.48	12.12	4.11	3.56	11.85	4.11	5.46
6500	5.09	4.23	11.82	4.29	4.17	12.09	13.43	4.48	12.09	4.11	3.56	11.82	4.11	5.46
7000	5.09	4.23	11.79	4.29	4.17	12.05	13.39	4.48	12.05	4.11	3.56	11.79	4.11	5.46
7500	5.09	4.23	11.74	4.29	4.17	12.01	13.34	4.48	12.01	4.11	3.56	11.74	4.11	5.46
8000	5.09	4.23	11.68	4.29	4.17	11.95	13.28	4.48	11.95	4.11	3.56	11.68	4.11	5.46
8500	5.09	4.23	11.62	4.29	4.17	11.89	13.21	4.48	11.89	4.11	3.56	11.62	4.11	5.46
9000	5.09	4.23	11.55	4.29	4.17	11.81	13.12	4.48	11.81	4.11	3.56	11.55	4.11	5.46
9500	5.09	4.23	11.47	4.29	4.17	11.73	13.03	4.48	11.73	4.11	3.56	11.47	4.11	5.46
10000	5.09	4.23	11.38	4.29	4.17	11.63	12.93	4.48	11.63	4.11	3.56	11.38	4.11	5.46
10500	5.09	4.23	11.28	4.29	4.17	11.53	12.81	4.48	11.53	4.11	3.56	11.28	4.11	5.46
11000	5.09	4.23	11.17	4.29	4.17	11.42	12.69	4.48	11.42	4.11	3.56	11.17	4.11	5.46
11500	5.09	4.23	11.05	4.29	4.17	11.30	12.56	4.48	11.30	4.11	3.56	11.05	4.11	5.46
12000	5.09	4.23	10.93	4.29	4.17	11.18	12.42	4.48	11.18	4.11	3.56	10.93	4.11	5.46
12500	5.09	4.23	10.80	4.29	4.17	11.04	12.27	4.48	11.04	4.11	3.56	10.80	4.11	5.46
13000	5.09	4.23	10.66	4.29	4.17	10.90	12.11	4.48	10.90	4.11	3.56	10.66	4.11	5.46
13500	5.09	4.23	10.51	4.29	4.17	10.75	11.95	4.48	10.75	4.11	3.56	10.51	4.11	5.46
14000	5.09	4.23	10.36	4.29	4.17	10.60	11.77	4.48	10.60	4.11	3.56	10.36	4.11	5.46
14500	5.09	4.23	10.20	4.29	4.17	10.43	11.59	4.48	10.43	4.11	3.56	10.20	4.11	5.46
15000	5.09	4.23	10.04	4.29	4.17	10.27	11.41	4.48	10.27	4.11	3.56	10.04	4.11	5.46
15500	5.09	4.23	9.87	4.29	4.17	10.09	11.21	4.48	10.09	4.11	3.56	9.87	4.11	5.46
16000	5.09	4.23	9.69	4.29	4.17	9.91	11.01	4.48	9.91	4.11	3.56	9.69	4.11	5.46
16500	5.09	4.23	9.51	4.29	4.17	9.73	10.81	4.48	9.73	4.11	3.56	9.51	4.11	5.46
17000	5.09	4.23	9.33	4.29	4.17	9.54	10.60	4.48	9.54	4.11	3.56	9.33	4.11	5.46
17500	5.09	4.23	9.14	4.29	4.17	9.35	10.39	4.48	9.35	4.11	3.56	9.14	4.11	5.46
18000	5.09	4.23	8.95	4.29	4.17	9.15	10.17	4.48	9.15	4.11	3.56	8.95	4.11	5.46
18500	5.09	4.23	8.75	4.29	4.17	8.95	9.95	4.48	8.95	4.11	3.56	8.75	4.11	5.46
19000	5.09	4.23	8.55	4.29	4.17	8.75	9.72	4.48	8.75	4.11	3.56	8.55	4.11	5.46
19500	5.09	4.23	8.35	4.29	4.17	8.54	9.49	4.48	8.54	4.11	3.56	8.35	4.11	5.46
20000	5.09	4.23	8.13	4.29	4.17	8.32	9.24	4.48	8.32	4.11	3.56	8.13	4.11	5.46
20500	5.09	4.23	7.91	4.29	4.17	8.09	8.99	4.48	8.09	4.11	3.56	7.91	4.11	5.46
21000	5.09	4.23	7.68	4.29	4.17	7.85	8.73	4.48	7.85	4.11	3.56	7.68	4.11	5.46
21500	5.09	4.23	7.44	4.29	4.17	7.61	8.45	4.48	7.61	4.11	3.56	7.44	4.11	5.46
22000	5.09	4.23	7.20	4.29	4.17	7.37	8.18	4.48	7.37	4.11	3.56	7.20	4.11	5.46
22500	5.09	4.23	7.03	4.29	4.17	7.19	7.99	4.48	7.19	4.11	3.56	7.03	4.11	5.46
23000	5.09	4.23	6.82	4.29	4.17	6.97	7.75	4.48	6.97	4.11	3.56	6.82	4.11	5.46
23500	5.09	4.23	6.66	4.29	4.17	6.81	7.57	4.48	6.81	4.11	3.56	6.66	4.11	5.46
24000	5.09	4.23	6.55	4.29	4.17	6.70	7.44	4.48	6.70	4.11	3.56	6.55	4.11	5.46
24500	5.09	4.23	6.22	4.29	4.17	6.36	7.06	4.48	6.36	4.11	3.56	6.22	4.11	5.46
25000	5.09	4.23	5.89	4.29	4.17	6.02	6.69	4.48	6.02	4.11	3.56	5.89	4.11	5.46
25500	5.09	4.23	5.56	4.29	4.17	5.68	6.32	4.48	5.68	4.11	3.56	5.56	4.11	5.46
26000	5.09	4.23	5.40	4.29	4.17	5.52	6.14	4.48	5.52	4.11	3.56	5.40	4.11	5.46
26500	5.09	4.23	5.44	4.29	4.17	5.57	6.19	4.48	5.57	4.11	3.56	5.44	4.11	5.46
27000	5.09	4.23	5.48	4.29	4.17	5.60	6.22	4.48	5.60	4.11	3.56	5.48	4.11	5.46
27500	5.09	4.23	5.56	4.29	4.17	5.69	6.32	4.48	5.69	4.11	3.56	5.56	4.11	5.46
28000	5.09	4.23	5.63	4.29	4.17	5.76	6.40	4.48	5.76	4.11	3.56	5.63	4.11	5.46
28500	5.09	4.23	5.71	4.29	4.17	5.84	6.49	4.48	5.84	4.11	3.56	5.71	4.11	5.46
29000	5.09	4.23	5.74	4.29	4.17	5.87	6.52	4.48	5.87	4.11	3.56	5.74	4.11	5.46
29500	5.09	4.23	5.78	4.29	4.17	5.91	6.57	4.48	5.91	4.11	3.56	5.78	4.11	5.46
30000	5.09	4.23	5.76	4.29	4.17	5.89	6.55	4.48	5.89	4.11	3.56	5.76	4.11	5.46
30500	5.09	4.23	5.80	4.29	4.17	5.93	6.59	4.48	5.93	4.11	3.56	5.80	4.11	5.46
31000	5.09	4.23	5.80	4.29	4.17	5.93	6.59	4.48	5.93	4.11	3.56	5.80	4.11	5.46
31500	5.09	4.23	5.80	4.29	4.17	5.93	6.59	4.48	5.93	4.11	3.56	5.80	4.11	5.46
32000	5.09	4.23	5.79	4.29	4.17	5.93	6.58	4.48	5.93	4.11	3.56	5.79	4.11	5.46
32500	5.09	4.23	5.79	4.29	4.17	5.93	6.58	4.48	5.93	4.11	3.56	5.79	4.11	5.46
33000	5.09	4.23	5.79	4.29	4.17	5.92	6.58	4.48	5.92	4.11	3.56	5.79	4.11	5.46
33500	5.09	4.23	5.79	4.29	4.17	5.93	6.58	4.48	5.93	4.11	3.56	5.79	4.11	5.46
34000	5.09	4.23	5.79	4.29	4.17	5.92	6.58	4.48	5.92	4.11	3.56	5.79	4.11	5.46
34500	5.09	4.23	5.76	4.29	4.17	5.89	6.55	4.48	5.89	4.11	3.56	5.76	4.11	5.46
35000	5.09	4.23	5.73	4.29	4.17	5.87	6.52	4.48	5.87	4.11	3.56	5.73	4.11	5.46

REPRESENTATIVE GROUP 1
HAI VALUES (PERCENT)

Qms	135.5R	135.6R	136.9R	139.0L	139.9R
5000	8.64	14.57	4.23	12.14	4.54
5500	8.63	14.56	4.23	12.14	4.54
6000	8.62	14.54	4.23	12.12	4.54
6500	8.60	14.51	4.23	12.09	4.54
7000	8.57	14.46	4.23	12.05	4.54
7500	8.54	14.41	4.23	12.01	4.54
8000	8.50	14.34	4.23	11.95	4.54
8500	8.45	14.26	4.23	11.89	4.54
9000	8.40	14.17	4.23	11.81	4.54
9500	8.34	14.07	4.23	11.73	4.54
10000	8.27	13.96	4.23	11.63	4.54
10500	8.20	13.84	4.23	11.53	4.54
11000	8.12	13.71	4.23	11.42	4.54
11500	8.04	13.57	4.23	11.30	4.54
12000	7.95	13.41	4.23	11.18	4.54
12500	7.85	13.25	4.23	11.04	4.54
13000	7.75	13.08	4.23	10.90	4.54
13500	7.65	12.90	4.23	10.75	4.54
14000	7.54	12.72	4.23	10.60	4.54
14500	7.42	12.52	4.23	10.43	4.54
15000	7.30	12.32	4.23	10.27	4.54
15500	7.18	12.11	4.23	10.09	4.54
16000	7.05	11.90	4.23	9.91	4.54
16500	6.92	11.68	4.23	9.73	4.54
17000	6.78	11.45	4.23	9.54	4.54
17500	6.65	11.22	4.23	9.35	4.54
18000	6.51	10.98	4.23	9.15	4.54
18500	6.37	10.74	4.23	8.95	4.54
19000	6.22	10.50	4.23	8.75	4.54
19500	6.07	10.25	4.23	8.54	4.54
20000	5.92	9.98	4.23	8.32	4.54
20500	5.75	9.71	4.23	8.09	4.54
21000	5.58	9.42	4.23	7.85	4.54
21500	5.41	9.13	4.23	7.61	4.54
22000	5.24	8.84	4.23	7.37	4.54
22500	5.11	8.63	4.23	7.19	4.54
23000	4.96	8.37	4.23	6.97	4.54
23500	4.85	8.18	4.23	6.81	4.54
24000	4.76	8.04	4.23	6.70	4.54
24500	4.52	7.63	4.23	6.36	4.54
25000	4.28	7.23	4.23	6.02	4.54
25500	4.04	6.82	4.23	5.68	4.54
26000	3.93	6.63	4.23	5.52	4.54
26500	3.96	6.68	4.23	5.57	4.54
27000	3.98	6.72	4.23	5.60	4.54
27500	4.04	6.82	4.23	5.69	4.54
28000	4.10	6.91	4.23	5.76	4.54
28500	4.15	7.01	4.23	5.84	4.54
29000	4.18	7.05	4.23	5.87	4.54
29500	4.20	7.09	4.23	5.91	4.54
30000	4.19	7.07	4.23	5.89	4.54
30500	4.22	7.12	4.23	5.93	4.54
31000	4.22	7.12	4.23	5.93	4.54
31500	4.22	7.12	4.23	5.93	4.54
32000	4.21	7.11	4.23	5.93	4.54
32500	4.21	7.11	4.23	5.93	4.54
33000	4.21	7.10	4.23	5.92	4.54
33500	4.21	7.11	4.23	5.93	4.54
34000	4.21	7.11	4.23	5.92	4.54
34500	4.19	7.07	4.23	5.89	4.54
35000	4.17	7.04	4.23	5.87	4.54

REPRESENTATIVE GROUP II
HAI VALUES (PERCENT)

Qms	100.6R	101.4L	101.8L	113.1R	113.7R	115.6R	117.9L	118.0L	121.8R	122.4R	122.5R	123.6R	125.1R	125.9R
5000	3.56	14.53	3.86	8.05	13.25	14.53	3.68	10.05	6.95	7.53	13.66	11.17	12.86	15.06
5500	3.56	14.53	3.86	8.05	13.20	14.53	3.68	10.09	6.98	7.53	13.91	11.17	13.10	15.06
6000	3.56	14.53	3.86	8.05	13.16	14.53	3.68	10.18	7.04	7.53	14.16	11.17	13.33	15.06
6500	3.56	14.53	3.86	8.05	13.11	14.53	3.68	10.31	7.14	7.53	14.42	11.17	13.58	15.06
7000	3.56	14.53	3.86	8.05	13.14	14.53	3.68	10.45	7.23	7.53	14.68	11.13	13.82	15.06
7500	3.56	14.53	3.85	8.02	13.19	14.53	3.68	10.64	7.37	7.51	14.96	11.09	14.08	15.06
8000	3.56	14.53	3.85	8.00	13.31	14.53	3.67	10.83	7.50	7.48	15.23	11.06	14.33	15.06
8500	3.56	14.53	3.85	7.97	13.48	14.53	3.67	11.03	7.64	7.46	15.51	11.08	14.60	15.06
9000	3.56	14.53	3.84	7.98	13.66	14.53	3.66	11.23	7.77	7.47	15.85	11.12	14.91	15.06
9500	3.56	14.53	3.84	8.02	13.91	14.53	3.66	11.44	7.92	7.50	16.18	11.22	15.23	15.06
10000	3.56	14.53	3.83	8.09	14.16	14.53	3.65	11.65	8.06	7.57	16.59	11.37	15.61	15.06
10500	3.56	14.53	3.82	8.19	14.42	14.53	3.65	11.86	8.21	7.67	17.09	11.52	16.09	15.06
11000	3.56	14.53	3.81	8.30	14.68	14.53	3.64	12.12	8.39	7.77	17.64	11.73	16.60	15.06
11500	3.56	14.53	3.81	8.46	14.96	14.53	3.63	12.38	8.57	7.91	18.11	11.94	17.05	15.06
12000	3.56	14.53	3.80	8.61	15.23	14.53	3.62	12.68	8.78	8.05	18.59	12.16	17.50	15.06
12500	3.56	14.53	3.78	8.77	15.51	14.53	3.61	13.07	9.05	8.20	19.08	12.38	17.96	15.06
13000	3.56	14.53	3.77	8.92	15.85	14.53	3.60	13.49	9.34	8.35	19.56	12.61	18.41	15.06
13500	3.56	14.53	3.76	9.09	16.18	14.53	3.59	13.85	9.59	8.51	19.95	12.84	18.78	15.06
14000	3.56	14.53	3.75	9.26	16.59	14.53	3.57	14.22	9.84	8.66	20.40	13.08	19.20	15.06
14500	3.56	14.53	3.73	9.43	17.09	14.53	3.56	14.59	10.10	8.82	20.87	13.36	19.64	15.06
15000	3.56	14.53	3.71	9.63	17.64	14.53	3.54	14.96	10.36	9.01	21.38	13.64	20.13	15.06
15500	3.56	14.53	3.70	9.84	18.11	14.53	3.53	15.26	10.56	9.20	21.95	13.99	20.66	15.06
16000	3.56	14.53	3.68	10.08	18.59	14.53	3.51	15.60	10.80	9.43	22.46	14.41	21.14	15.06
16500	3.56	14.53	3.66	10.39	19.08	14.53	3.49	15.96	11.05	9.72	22.99	14.87	21.63	15.06
17000	3.56	14.53	3.64	10.72	19.56	14.53	3.47	16.35	11.32	10.03	23.51	15.27	22.13	15.06
17500	3.56	14.53	3.62	11.01	19.95	14.53	3.45	16.78	11.62	10.30	23.99	15.68	22.58	15.06
18000	3.56	14.53	3.60	11.30	20.40	14.53	3.43	17.17	11.89	10.57	24.40	16.09	22.97	15.06
18500	3.56	14.53	3.58	11.60	20.87	14.53	3.41	17.58	12.17	10.85	24.79	16.49	23.34	15.06
19000	3.55	14.53	3.56	11.89	21.38	14.53	3.39	17.98	12.45	11.12	25.17	16.82	23.69	15.06
19500	3.55	14.53	3.53	12.13	21.95	14.53	3.37	18.35	12.70	11.34	25.49	17.20	23.99	15.06
20000	3.55	14.53	3.51	12.40	22.46	14.53	3.35	18.66	12.92	11.60	25.77	17.59	24.26	15.06
20500	3.54	14.53	3.52	12.68	22.99	14.53	3.36	18.96	13.13	11.87	25.82	18.03	24.30	15.06
21000	3.54	14.53	3.55	13.00	23.51	14.53	3.38	19.25	13.32	12.16	25.94	18.51	24.42	15.06
21500	3.53	14.53	3.75	13.34	23.99	14.53	3.57	19.49	13.50	12.48	26.25	18.93	24.70	15.06
22000	3.52	14.53	4.46	13.65	24.40	14.53	4.25	19.71	13.64	12.77	26.76	19.38	25.18	15.06
22500	3.51	14.74	5.71	13.97	24.79	14.53	5.44	19.74	13.67	13.07	27.45	19.82	25.83	15.06
23000	3.50	15.82	9.76	14.29	25.17	14.53	9.31	19.84	13.74	13.37	28.36	20.23	26.69	15.06
23500	3.49	17.06	15.53	14.58	25.49	14.74	14.81	20.07	13.90	13.64	29.52	20.58	27.78	15.06
24000	3.48	18.57	19.33	14.83	25.77	15.82	18.44	20.46	14.17	13.88	31.22	20.90	29.38	15.06
24500	3.47	21.19	23.50	15.07	25.82	17.06	22.42	20.99	14.53	14.10	33.36	21.22	31.39	15.06
25000	3.46	25.37	26.19	15.30	25.94	18.57	24.98	21.68	15.01	14.31	36.02	21.49	33.90	15.06
25500	3.44	29.59	28.36	15.50	26.25	21.19	27.05	22.57	15.63	14.50	38.39	21.73	36.13	15.06
26000	3.43	32.28	30.01	15.67	26.76	25.37	28.63	23.87	16.53	14.65	40.34	21.77	37.97	15.06
26500	3.41	33.71	31.16	15.69	27.45	29.59	29.72	25.51	17.66	14.68	41.51	21.87	39.07	15.28
27000	3.40	34.65	32.22	15.77	28.36	32.28	30.73	27.54	19.07	14.75	42.55	22.13	40.05	16.41
27500	3.38	35.01	32.16	15.95	29.52	33.71	30.67	29.36	20.32	14.93	42.74	22.56	40.22	17.69
28000	3.36	34.75	31.18	16.26	31.22	34.65	29.74	30.85	21.36	15.22	42.43	23.14	39.94	19.26
28500	3.34	34.17	29.26	16.68	33.36	35.01	27.91	31.75	21.98	15.61	41.78	23.91	39.32	21.97
29000	3.32	33.00	26.85	17.24	36.02	34.75	25.61	32.54	22.53	16.12	40.75	24.89	38.35	26.31
29500	3.30	31.42	23.73	17.94	38.39	34.17	22.63	32.68	22.63	16.78	39.75	26.32	37.41	30.68
30000	3.28	29.83	20.49	18.98	40.34	33.00	19.54	32.45	22.46	17.75	38.77	28.12	36.49	33.47
30500	3.26	28.29	17.69	20.28	41.51	31.42	16.88	31.95	22.12	18.97	37.83	30.37	35.60	34.96
31000	3.24	26.92	15.19	21.89	42.55	29.83	14.49	31.16	21.57	20.48	36.94	32.37	34.77	35.93
31500	3.25	25.72	13.19	23.33	42.74	28.29	12.59	30.40	21.05	21.83	35.93	34.02	33.82	36.31
32000	3.28	24.66	11.39	24.52	42.43	26.92	10.86	29.65	20.53	22.94	34.87	35.00	32.82	36.04
32500	3.46	23.73	9.78	25.23	41.78	25.72	9.33	28.93	20.03	23.61	33.87	35.88	31.88	35.44
33000	4.11	22.91	8.34	25.87	40.75	24.66	7.96	28.25	19.56	24.20	32.84	36.03	30.91	34.22
33500	5.27	22.21	7.19	25.98	39.75	23.73	6.86	27.48	19.02	24.30	31.81	35.78	29.94	32.58
34000	9.01	21.60	6.30	25.79	38.77	22.91	6.01	26.67	18.46	24.13	30.81	35.22	29.00	30.94
34500	14.34	21.08	5.57	25.39	37.83	22.21	5.32	25.90	17.93	23.76	29.88	34.35	28.12	29.34
35000	17.84	20.64	4.93	24.77	36.94	21.60	4.70	25.11	17.38	23.17	28.97	33.52	27.27	27.92

REPRESENTATIVE GROUP II
HAI VALUES (PERCENT)

Qms	126.0R	126.3R	131.8L	133.9R	135.3L	137.5L	137.5R	137.8L	137.9L	140.2R	142.1R	142.2R	143.4L	144.4L
5000	17.64	3.50	11.69	17.29	7.74	3.62	11.33	14.53	13.05	12.99	3.56	3.09	14.79	3.56
5500	17.64	3.50	11.69	17.29	7.71	3.62	11.38	14.53	13.22	12.99	3.56	3.09	14.79	3.56
6000	17.64	3.50	11.69	17.29	7.73	3.62	11.48	14.53	13.39	12.99	3.56	3.08	14.79	3.56
6500	17.64	3.50	11.69	17.29	7.76	3.62	11.63	14.53	13.64	12.99	3.56	3.08	14.79	3.56
7000	17.64	3.50	11.69	17.29	7.83	3.62	11.79	14.53	13.88	12.99	3.56	3.08	14.79	3.55
7500	17.64	3.50	11.69	17.29	7.93	3.62	12.00	14.53	14.14	12.99	3.56	3.08	14.79	3.55
8000	17.64	3.50	11.69	17.29	8.04	3.62	12.22	14.53	14.39	12.94	3.56	3.07	14.79	3.55
8500	17.64	3.50	11.65	17.29	8.19	3.62	12.45	14.53	14.67	12.90	3.56	3.07	14.79	3.54
9000	17.64	3.50	11.61	17.29	8.33	3.62	12.67	14.53	14.93	12.86	3.56	3.06	14.79	3.54
9500	17.64	3.50	11.57	17.29	8.49	3.62	12.91	14.53	15.21	12.88	3.56	3.06	14.79	3.53
10000	17.64	3.50	11.59	17.29	8.64	3.62	13.14	14.53	15.54	12.93	3.56	3.05	14.79	3.52
10500	17.64	3.50	11.64	17.29	8.80	3.62	13.38	14.53	15.87	13.05	3.56	3.04	14.79	3.51
11000	17.64	3.50	11.74	17.29	8.96	3.62	13.67	14.53	16.26	13.22	3.56	3.04	14.79	3.50
11500	17.64	3.49	11.90	17.29	9.13	3.62	13.96	14.53	16.76	13.39	3.56	3.03	14.79	3.49
12000	17.64	3.49	12.05	17.29	9.32	3.62	14.31	14.53	17.29	13.64	3.56	3.02	14.79	3.48
12500	17.64	3.48	12.28	17.29	9.52	3.62	14.75	14.53	17.76	13.88	3.55	3.01	14.79	3.47
13000	17.64	3.48	12.49	17.29	9.76	3.62	15.22	14.53	18.23	14.14	3.55	3.00	14.79	3.46
13500	17.64	3.47	12.73	17.29	10.05	3.62	15.62	14.53	18.71	14.39	3.55	2.98	14.79	3.44
14000	17.64	3.46	12.95	17.29	10.37	3.62	16.04	14.53	19.18	14.67	3.54	2.97	14.79	3.43
14500	17.64	3.45	13.20	17.29	10.65	3.62	16.46	14.53	19.56	14.93	3.54	2.96	14.79	3.41
15000	17.64	3.44	13.44	17.29	10.94	3.61	16.88	14.53	20.00	15.21	3.53	2.94	14.79	3.40
15500	17.64	3.43	13.69	17.29	11.22	3.61	17.21	14.53	20.46	15.54	3.52	2.93	14.79	3.38
16000	17.64	3.42	13.98	17.29	11.51	3.61	17.60	14.53	20.96	15.87	3.51	2.91	14.79	3.36
16500	17.64	3.41	14.28	17.29	11.74	3.60	18.00	14.53	21.52	16.26	3.50	2.90	14.79	3.34
17000	17.64	3.40	14.64	17.29	12.00	3.59	18.45	14.53	22.02	16.76	3.49	2.88	14.79	3.32
17500	17.64	3.39	15.08	17.29	12.27	3.59	18.94	14.53	22.54	17.29	3.48	2.86	14.79	3.30
18000	17.64	3.37	15.56	17.29	12.58	3.58	19.37	14.53	23.05	17.76	3.47	2.84	14.79	3.28
18500	17.64	3.36	15.98	17.29	12.91	3.57	19.83	14.53	23.52	18.23	3.46	2.83	14.79	3.26
19000	17.64	3.34	16.40	17.29	13.21	3.56	20.28	14.53	23.93	18.71	3.44	2.81	14.79	3.24
19500	17.64	3.32	16.84	17.29	13.52	3.55	20.70	14.53	24.31	19.18	3.43	2.81	14.79	3.25
20000	17.64	3.31	17.26	17.29	13.83	3.54	21.05	14.53	24.67	19.56	3.41	2.84	14.79	3.28
20500	17.64	3.29	17.60	17.29	14.11	3.53	21.39	14.74	24.99	20.00	3.40	3.00	14.79	3.46
21000	17.64	3.27	18.00	17.29	14.36	3.51	21.71	15.82	25.27	20.46	3.38	3.57	14.79	4.11
21500	17.64	3.25	18.41	17.29	14.58	3.50	21.99	17.06	25.31	20.96	3.36	4.57	14.79	5.27
22000	17.64	3.23	18.87	17.29	14.80	3.49	22.23	18.57	25.44	21.52	3.34	7.81	14.79	9.01
22500	17.64	3.21	19.37	17.29	15.00	3.47	22.27	21.19	25.73	22.02	3.32	12.43	14.79	14.34
23000	17.64	3.19	19.81	17.29	15.16	3.45	22.38	25.37	26.23	22.54	3.30	15.47	14.79	17.84
23500	17.64	3.19	20.28	17.29	15.19	3.44	22.65	29.59	26.91	23.05	3.28	18.80	14.79	21.70
24000	17.64	3.22	20.74	17.29	15.26	3.42	23.09	32.28	27.80	23.52	3.26	20.95	14.79	24.18
24500	17.64	3.40	21.17	17.29	15.44	3.40	23.68	33.71	28.94	23.93	3.24	22.69	14.79	26.18
25000	17.64	4.05	21.53	17.29	15.74	3.38	24.46	34.65	30.61	24.31	3.25	24.01	14.79	27.70
25500	17.64	5.18	21.88	17.29	16.14	3.36	25.47	35.01	32.70	24.67	3.28	24.93	14.79	28.76
26000	17.64	8.86	22.21	17.29	16.68	3.34	26.93	34.75	35.31	24.99	3.46	25.77	14.79	29.74
26500	17.64	14.10	22.49	17.29	17.36	3.31	28.78	34.17	37.64	25.27	4.11	25.72	14.79	29.68
27000	17.64	17.55	22.74	17.29	18.36	3.30	31.07	33.00	39.55	25.31	5.27	24.95	14.79	28.78
27500	17.64	21.33	22.78	17.29	19.62	3.30	33.12	31.42	40.70	25.44	9.01	23.41	14.79	27.01
28000	17.64	23.77	22.89	17.29	21.19	3.33	34.81	29.83	41.72	25.73	14.34	21.48	14.79	24.78
28500	17.64	25.74	23.16	17.29	22.58	3.51	35.82	28.29	41.90	26.23	17.84	18.98	14.79	21.90
29000	17.64	27.24	23.61	17.29	23.73	4.18	36.71	26.92	41.60	26.91	21.70	16.39	14.79	18.91
29500	17.64	28.28	24.22	20.54	24.42	5.36	36.87	25.72	40.96	27.80	24.18	14.15	14.79	16.33
30000	17.64	29.24	25.02	23.78	25.03	9.16	36.61	24.66	39.95	28.94	26.18	12.15	14.79	14.02
30500	17.64	29.19	26.04	23.46	25.14	14.58	36.04	23.73	38.97	30.61	27.70	10.56	15.01	12.18
31000	17.64	28.30	27.55	22.80	24.96	18.14	35.15	22.91	38.01	32.70	28.76	9.11	16.11	10.51
31500	17.64	26.56	29.43	22.40	24.57	22.06	34.30	22.21	37.09	35.31	29.74	7.82	17.37	9.02
32000	17.64	24.37	31.78	22.07	23.97	24.58	33.45	21.60	36.21	37.64	29.68	6.67	18.92	7.70
32500	20.95	21.54	33.87	21.75	23.38	26.61	32.64	21.08	35.23	39.55	28.78	5.75	21.58	6.64
33000	24.26	18.60	35.60	21.55	22.81	28.17	31.87	20.64	34.19	40.70	27.01	5.04	25.84	5.82
33500	23.93	16.06	36.63	21.37	22.25	29.24	31.00	20.26	33.21	41.72	24.78	4.46	30.14	5.14
34000	23.26	13.78	37.55	21.22	21.73	30.24	30.09	19.92	32.19	41.90	21.90	3.95	32.88	4.55
34500	22.85	11.98	37.71	21.09	21.14	30.18	29.22	19.65	31.19	41.60	18.91	3.55	34.34	4.10
35000	22.51	10.34	37.44	20.98	20.51	29.26	28.33	19.33	30.21	40.96	16.33	3.17	35.29	3.66

REPRESENTATIVE GROUP III
HAI VALUES (PERCENT)

Qms	100.4R	100.6L	101.2R	101.6L	101.7L	110.4L	115.0R	119.3L	128.5R	128.7R	128.8R	130.2R	130.2L	132.6L
5000	0.00	2.06	0.00	0.00	2.06	0.00	0.00	0.00	0.00	0.00	2.06	21.60	0.00	0.00
5500	0.00	2.06	0.00	0.00	2.06	0.00	0.00	0.00	0.00	0.00	2.06	21.60	0.00	0.00
6000	0.00	2.06	0.00	0.00	2.06	0.00	0.00	0.00	0.00	0.00	2.06	21.60	3.39	0.00
6500	0.00	2.06	0.00	0.00	2.06	0.00	0.00	0.00	1.82	0.00	2.06	21.60	6.79	1.86
7000	0.00	2.06	3.17	0.00	2.06	0.00	0.00	0.00	3.65	0.00	2.06	21.60	10.18	3.73
7500	0.00	2.06	6.33	0.00	2.06	0.00	0.00	0.00	5.47	0.00	2.06	21.60	13.57	5.59
8000	0.00	2.06	9.50	0.00	2.06	0.00	0.00	0.00	7.30	0.00	2.06	21.60	16.96	7.45
8500	0.00	2.06	12.67	0.00	2.06	0.00	0.00	0.00	9.12	0.00	2.06	21.60	32.43	9.31
9000	0.00	2.06	15.83	0.00	2.06	0.00	0.00	0.00	10.95	0.00	2.06	21.60	33.61	11.18
9500	0.00	2.98	30.27	0.00	2.06	0.00	0.00	0.00	12.77	0.00	2.06	21.60	35.30	13.04
10000	0.00	4.39	31.37	0.00	2.98	3.79	3.11	0.00	14.60	0.00	2.06	21.32	34.98	14.90
10500	2.88	6.61	32.94	0.00	4.39	7.58	6.22	0.00	21.17	0.00	2.06	21.05	32.35	21.62
11000	5.77	10.17	32.64	0.00	6.61	11.37	9.33	0.00	27.75	1.86	2.06	20.79	29.09	28.33
11500	8.65	16.02	30.19	0.00	10.17	15.15	12.44	0.00	27.14	3.73	2.06	20.54	26.88	27.71
12000	11.54	26.39	27.15	3.17	16.02	18.94	15.55	0.00	26.54	5.59	2.06	20.31	23.44	27.09
12500	14.42	27.05	25.09	6.33	26.39	36.21	29.73	0.00	26.10	7.45	2.06	20.08	22.00	26.65
13000	27.57	27.88	21.88	9.50	27.05	37.53	30.81	0.00	25.67	9.31	2.06	17.38	19.02	26.20
13500	28.57	27.35	20.53	12.67	27.88	39.41	32.35	0.00	25.16	11.18	2.06	16.06	17.26	25.69
14000	30.00	26.26	17.75	15.83	27.35	39.06	32.06	3.17	24.66	13.04	2.06	15.59	15.81	25.17
14500	29.73	25.13	16.11	30.27	26.26	36.12	29.65	6.33	24.24	14.90	2.06	15.34	13.55	24.74
15000	27.50	24.22	14.75	31.37	25.13	32.48	26.66	9.50	23.81	21.62	2.06	14.16	13.01	24.31
15500	24.72	23.00	12.64	32.94	24.22	30.02	24.64	12.67	22.66	28.33	2.06	15.53	12.51	23.14
16000	22.85	21.49	12.15	32.64	23.00	26.17	21.49	15.83	21.51	27.71	2.06	14.45	12.04	21.96
16500	19.92	19.44	11.68	30.19	21.49	24.56	20.16	30.27	20.84	27.09	2.98	14.00	11.60	21.27
17000	18.70	16.93	11.24	27.15	19.44	21.24	17.43	31.37	20.16	26.65	4.39	13.31	11.18	20.58
17500	16.17	15.35	10.83	25.09	16.93	19.28	15.83	32.94	18.94	26.20	6.61	12.59	10.79	19.33
18000	14.67	13.99	10.43	21.88	15.35	17.65	14.49	32.64	17.71	25.69	10.17	12.02	10.41	18.08
18500	13.44	12.31	10.07	20.53	13.99	15.13	12.42	30.19	16.29	25.17	16.02	11.97	10.06	16.63
19000	11.51	11.16	9.72	17.75	12.31	14.53	11.93	27.15	14.86	24.74	26.39	10.89	9.72	15.17
19500	11.06	9.85	9.39	16.11	11.16	13.97	11.47	25.09	14.00	24.31	27.05	10.15	9.40	14.30
20000	10.64	8.39	9.07	14.75	9.85	13.45	11.04	21.88	13.15	23.14	27.88	10.33	9.10	13.42
20500	10.24	7.17	8.77	12.64	8.39	12.95	10.63	20.53	13.08	21.96	27.35	10.99	8.81	13.36
21000	9.86	6.14	8.49	12.15	7.17	12.48	10.25	17.75	13.02	21.27	26.26	10.34	8.53	13.29
21500	9.50	6.15	8.22	11.68	6.14	12.04	9.89	16.11	12.09	20.58	25.13	10.34	8.27	12.35
22000	9.17	6.09	7.96	11.24	6.15	11.63	9.54	14.75	11.17	19.33	24.22	10.08	8.02	11.40
22500	8.85	5.95	7.72	10.83	6.09	11.23	9.22	12.64	10.77	18.08	23.00	9.33	7.78	10.99
23000	8.55	6.09	7.48	10.43	5.95	10.86	8.91	12.15	10.36	16.63	21.49	9.37	7.55	10.58
23500	8.26	6.64	7.26	10.07	6.09	10.50	8.62	11.68	10.40	15.17	19.44	8.72	7.33	10.62
24000	7.99	6.79	7.05	9.72	6.64	10.16	8.34	11.24	10.44	14.30	16.93	8.42	7.12	10.66
24500	7.73	6.47	6.84	9.39	6.79	9.84	8.07	10.83	10.08	13.42	15.35	8.78	6.92	10.29
25000	7.49	6.87	6.64	9.07	6.47	9.53	7.82	10.43	9.71	13.36	13.99	8.35	6.72	9.91
25500	7.25	7.95	6.46	8.77	6.87	9.24	7.58	10.07	9.35	13.29	12.31	8.17	6.54	9.55
26000	7.03	8.07	6.27	8.49	7.95	8.96	7.35	9.72	8.99	12.35	11.16	7.53	6.36	9.18
26500	6.82	7.80	6.10	8.22	8.07	8.69	7.13	9.39	8.96	11.40	9.85	6.94	6.19	9.15
27000	6.61	7.81	5.93	7.96	7.80	8.43	6.92	9.07	8.93	10.99	8.39	6.98	6.02	9.12
27500	6.42	7.71	5.77	7.72	7.81	8.19	6.72	8.77	8.99	10.58	7.17	6.73	5.86	9.18
28000	6.23	7.63	5.62	7.48	7.71	7.95	6.53	8.49	9.05	10.62	6.14	6.79	5.71	9.24
28500	6.05	7.61	5.47	7.26	7.63	7.72	6.34	8.22	8.87	10.66	6.15	6.43	5.56	9.06
29000	5.88	7.59	5.33	7.05	7.61	7.51	6.16	7.96	8.69	10.29	6.09	6.72	5.42	8.87
29500	5.71	7.48	5.19	6.84	7.59	7.30	5.99	7.72	8.40	9.91	5.95	6.59	5.28	8.57
30000	5.56	7.63	5.05	6.64	7.48	7.10	5.83	7.48	8.10	9.55	6.09	6.49	5.14	8.27
30500	5.40	7.39	4.93	6.46	7.63	6.91	5.67	7.26	8.71	9.18	6.64	6.40	5.02	8.20
31000	5.26	6.26	4.80	6.27	7.39	6.72	5.52	7.05	7.69	9.15	6.79	6.23	4.89	7.85
31500	5.12	5.68	4.68	6.10	6.26	6.54	5.37	6.84	7.56	9.12	6.47	6.34	4.77	7.71
32000	4.98	5.78	4.57	5.93	5.68	6.37	5.23	6.64	7.43	9.18	6.87	6.41	4.66	7.58
32500	4.85	5.52	4.45	5.77	5.78	6.21	5.10	6.46	7.31	9.24	7.95	6.33	4.54	7.46
33000	4.72	4.95	4.35	5.62	5.52	6.05	4.96	6.27	7.19	9.06	8.07	6.17	4.43	7.34
33500	4.60	4.63	4.24	5.47	4.95	5.89	4.84	6.10	7.07	8.87	7.80	6.37	4.33	7.22
34000	4.49	4.62	4.14	5.33	4.63	5.74	4.72	5.93	6.96	8.57	7.81	6.27	4.23	7.10
34500	4.37	4.62	4.04	5.19	4.62	5.60	4.60	5.77	6.85	8.27	7.71	6.24	4.12	6.99
35000	4.26	4.55	3.94	5.05	4.62	5.46	4.48	5.62	6.74	8.90	7.63	6.33	4.03	6.88

REPRESENTATIVE GROUP III
HAI VALUES (PERCENT)

Q■s	133.7R	137.2R	141.4R
5000	1.97	0.00	18.90
5500	1.97	0.00	18.90
6000	1.97	0.00	18.90
6500	1.97	1.86	18.90
7000	1.97	3.73	18.90
7500	1.97	5.59	18.90
8000	1.97	7.45	18.90
8500	1.97	9.31	18.90
9000	1.97	11.18	18.90
9500	1.97	13.04	18.65
10000	1.97	14.90	18.42
10500	1.97	21.62	18.19
11000	1.97	28.33	17.98
11500	1.97	27.71	17.77
12000	2.85	27.09	17.57
12500	4.20	26.65	15.21
13000	6.32	26.20	14.05
13500	9.72	25.69	13.64
14000	15.32	25.17	13.42
14500	25.24	24.74	12.39
15000	25.87	24.31	13.59
15500	26.67	23.14	12.64
16000	26.16	21.96	12.25
16500	25.12	21.27	11.65
17000	24.04	20.58	11.02
17500	23.17	19.33	10.52
18000	22.00	18.08	10.47
18500	20.56	16.63	9.53
19000	18.59	15.17	8.88
19500	16.19	14.30	9.04
20000	14.68	13.42	9.62
20500	13.38	13.36	9.05
21000	11.77	13.29	9.05
21500	10.67	12.35	8.82
22000	9.42	11.40	8.16
22500	8.03	10.99	8.20
23000	6.86	10.58	7.63
23500	5.87	10.62	7.37
24000	5.88	10.66	7.68
24500	5.83	10.29	7.31
25000	5.69	9.91	7.15
25500	5.83	9.55	6.59
26000	6.35	9.18	6.07
26500	6.49	9.15	6.11
27000	6.19	9.12	5.89
27500	6.57	9.18	5.94
28000	7.60	9.24	5.63
28500	7.72	9.06	5.88
29000	7.46	8.87	5.77
29500	7.47	8.57	5.68
30000	7.37	8.27	5.60
30500	7.30	8.90	5.45
31000	7.28	7.85	5.55
31500	7.26	7.71	5.61
32000	7.15	7.58	5.54
32500	7.30	7.46	5.40
33000	7.07	7.34	5.57
33500	5.99	7.22	5.49
34000	5.44	7.10	5.46
34500	5.53	6.99	5.54
35000	5.28	6.88	5.49

REPRESENTATIVE GROUP IV
HAI VALUES (PERCENT)

Qms	100.7R	108.7L	110.8M	111.5R	112.6L	114.0R	116.8R	119.5L	119.6L	121.7R	124.1L	125.2R	127.0L	127.4L
5000	29.00	24.41	28.41	28.41	31.75	25.45	28.41	24.87	24.41	28.41	27.23	16.23	34.40	27.23
5500	30.11	22.78	29.49	29.49	28.51	26.42	29.49	23.21	22.78	29.49	28.27	14.78	30.89	28.27
6000	31.09	21.15	30.45	30.45	25.87	27.28	30.45	21.55	21.15	30.45	29.19	13.78	28.03	29.19
6500	31.90	19.48	31.25	31.25	23.17	27.99	31.25	19.84	19.48	31.25	29.95	13.05	25.10	29.95
7000	32.66	17.80	32.00	32.00	22.78	28.66	32.00	18.13	17.80	32.00	30.66	10.91	24.68	30.66
7500	33.69	16.32	33.00	33.00	20.43	29.56	33.00	16.63	16.32	33.00	31.62	9.72	22.13	31.62
8000	34.68	14.85	33.97	33.97	18.59	30.43	33.97	15.13	14.85	33.97	32.55	11.31	20.14	32.55
8500	34.46	13.77	33.76	33.76	16.29	30.24	33.76	14.03	13.77	33.76	32.35	10.26	17.65	32.35
9000	34.25	12.69	33.55	33.55	14.44	30.05	33.55	12.93	12.69	33.55	32.15	8.87	15.64	32.15
9500	32.51	11.68	31.84	31.84	12.39	28.53	31.84	11.90	11.68	31.84	30.52	7.55	13.42	30.52
10000	30.88	10.68	30.25	30.25	10.90	27.10	30.25	10.88	10.68	30.25	28.99	6.71	11.81	28.99
10500	28.70	9.53	28.11	28.11	10.37	25.19	28.11	9.71	9.53	28.11	26.94	7.00	11.23	26.94
11000	26.77	8.38	26.23	26.23	7.36	23.49	26.23	8.54	8.38	26.23	25.13	6.47	7.97	25.13
11500	26.45	9.55	25.91	25.91	5.89	23.21	25.91	9.73	9.55	25.91	24.83	5.66	6.38	24.83
12000	26.15	10.72	25.61	25.61	5.53	22.95	25.61	10.92	10.72	25.61	24.55	4.99	5.99	24.55
12500	25.44	10.57	24.92	24.92	5.16	22.33	24.92	10.77	10.57	24.92	23.88	4.42	5.59	23.88
13000	24.77	10.42	24.27	24.27	4.88	21.74	24.27	10.61	10.42	24.27	23.25	4.32	5.29	23.25
13500	23.58	10.07	23.10	23.10	4.85	20.70	23.10	10.26	10.07	23.10	22.14	3.89	5.25	22.14
14000	22.47	9.72	22.01	22.01	4.50	19.72	22.01	9.91	9.72	22.01	21.09	3.55	4.88	21.09
14500	21.78	8.90	21.33	21.33	4.37	19.11	21.33	9.07	8.90	21.33	20.45	3.25	4.73	20.45
15000	21.10	8.08	20.67	20.67	5.07	18.52	20.67	8.23	8.08	20.67	19.81	3.06	5.49	19.81
15500	20.34	7.87	19.92	19.92	5.14	17.85	19.92	8.02	7.87	19.92	19.09	3.02	5.57	19.09
16000	19.59	7.67	19.19	19.19	5.33	17.19	19.19	7.82	7.67	19.19	18.39	2.86	5.77	18.39
16500	19.15	7.32	18.76	18.76	5.10	16.80	18.76	7.46	7.32	18.76	17.98	2.85	5.53	17.98
17000	18.72	6.98	18.34	18.34	5.39	16.43	18.34	7.11	6.98	18.34	17.58	2.71	5.84	17.58
17500	18.08	6.59	17.71	17.71	4.99	15.87	17.71	6.71	6.59	17.71	16.97	2.65	5.41	16.97
18000	17.44	6.20	17.09	17.09	4.75	15.31	17.09	6.31	6.20	17.09	16.37	2.58	5.15	16.37
18500	16.96	6.17	16.62	16.62	4.35	14.89	16.62	6.29	6.17	16.62	15.92	2.44	4.71	15.92
19000	16.48	6.15	16.15	16.15	4.08	14.46	16.15	6.26	6.15	16.15	15.47	2.39	4.42	15.47
19500	16.16	6.52	15.83	15.83	3.78	14.19	15.83	6.64	6.52	15.83	15.18	2.11	4.10	15.18
20000	15.85	6.89	15.52	15.52	3.52	13.91	15.52	7.02	6.89	15.52	14.88	1.91	3.81	14.88
20500	15.63	6.86	15.31	15.31	3.33	13.72	15.31	6.99	6.86	15.31	14.68	1.91	3.61	14.68
21000	15.42	6.83	15.11	15.11	3.10	13.53	15.11	6.96	6.83	15.11	14.48	1.87	3.36	14.48
21500	15.06	6.77	14.75	14.75	2.88	13.22	14.75	6.90	6.77	14.75	14.14	1.87	3.12	14.14
22000	14.71	6.72	14.41	14.41	2.71	12.91	14.41	6.84	6.72	14.41	13.81	1.95	2.94	13.81
22500	14.37	6.62	14.07	14.07	2.61	12.61	14.07	6.74	6.62	14.07	13.49	1.98	2.83	13.49
23000	14.03	6.51	13.75	13.75	2.47	12.31	13.75	6.64	6.51	13.75	13.17	2.03	2.68	13.17
23500	13.71	6.45	13.43	13.43	2.35	12.03	13.43	6.57	6.45	13.43	12.87	2.06	2.55	12.87
24000	13.39	6.38	13.12	13.12	2.22	11.75	13.12	6.50	6.38	13.12	12.57	2.09	2.41	12.57
24500	13.08	6.28	12.81	12.81	2.17	11.48	12.81	6.40	6.28	12.81	12.28	2.12	2.35	12.28
25000	12.78	6.18	12.52	12.52	2.06	11.22	12.52	6.29	6.18	12.52	12.00	2.17	2.23	12.00
25500	12.48	5.96	12.23	12.23	2.00	10.95	12.23	6.08	5.96	12.23	11.72	2.20	2.17	11.72
26000	12.19	5.75	11.94	11.94	1.91	10.70	11.94	5.86	5.75	11.94	11.44	2.23	2.07	11.44
26500	11.91	5.72	11.67	11.67	1.81	10.45	11.67	5.83	5.72	11.67	11.18	2.22	1.96	11.18
27000	11.64	5.70	11.40	11.40	1.76	10.21	11.40	5.80	5.70	11.40	10.93	2.25	1.91	10.93
27500	11.37	5.66	11.14	11.14	1.66	9.98	11.14	5.77	5.66	11.14	10.68	2.30	1.80	10.68
28000	11.12	5.63	10.89	10.89	1.62	9.76	10.89	5.73	5.63	10.89	10.44	2.31	1.76	10.44
28500	10.87	5.56	10.65	10.65	1.53	9.54	10.65	5.67	5.56	10.65	10.20	2.33	1.66	10.20
29000	10.62	5.49	10.41	10.41	1.48	9.32	10.41	5.60	5.49	10.41	9.97	2.33	1.60	9.97
29500	10.38	5.43	10.17	10.17	1.40	9.11	10.17	5.53	5.43	10.17	9.75	2.34	1.52	9.75
30000	10.15	5.37	9.95	9.95	1.37	8.91	9.95	5.47	5.37	9.95	9.53	2.34	1.48	9.53
30500	9.88	5.39	9.68	9.68	1.30	8.67	9.68	5.49	5.39	9.68	9.27	2.37	1.41	9.27
31000	9.61	5.41	9.42	9.42	1.28	8.43	9.42	5.51	5.41	9.42	9.02	2.47	1.39	9.02
31500	9.41	5.36	9.21	9.21	1.23	8.25	9.21	5.46	5.36	9.21	8.83	2.53	1.33	8.83
32000	9.21	5.32	9.02	9.02	1.19	8.08	9.02	5.42	5.32	9.02	8.64	2.56	1.29	8.64
32500	9.03	5.28	8.85	8.85	1.14	7.92	8.85	5.38	5.28	8.85	8.48	2.59	1.24	8.48
33000	8.86	5.23	8.68	8.68	1.10	7.77	8.68	5.33	5.23	8.68	8.31	2.60	1.19	8.31
33500	8.69	5.20	8.51	8.51	1.10	7.62	8.51	5.30	5.20	8.51	8.15	2.63	1.19	8.15
34000	8.52	5.17	8.35	8.35	1.09	7.48	8.35	5.26	5.17	8.35	8.00	2.64	1.18	8.00
34500	8.36	5.14	8.19	8.19	1.05	7.33	8.19	5.24	5.14	8.19	7.85	2.64	1.14	7.85
35000	8.20	5.11	8.03	8.03	1.07	7.19	8.03	5.21	5.11	8.03	7.70	2.65	1.16	7.70

REPRESENTATIVE GROUP IV
HAI VALUES (PERCENT)

Qms	129.5R	131.7L	134.9R	136.0L	139.4L	139.6L	140.4R	144.0R	145.3R
5000	14.90	27.82	14.90	25.33	32.28	30.19	28.41	24.41	24.41
5500	13.57	28.88	13.57	23.64	28.99	31.34	29.49	22.78	22.78
6000	12.65	29.82	12.65	21.95	26.30	32.36	30.45	21.15	21.15
6500	11.98	30.60	11.98	20.21	23.56	33.20	31.25	19.48	19.48
7000	10.02	31.33	10.02	18.47	23.16	34.00	32.00	17.80	17.80
7500	8.92	32.31	8.92	16.94	20.77	35.06	33.00	16.32	16.32
8000	10.38	33.26	10.38	15.41	18.90	36.09	33.97	14.85	14.85
8500	9.42	33.05	9.42	14.29	16.56	35.87	33.76	13.77	13.77
9000	8.14	32.85	8.14	13.17	14.68	35.65	33.55	12.69	12.69
9500	6.93	31.18	6.93	12.13	12.60	33.83	31.84	11.68	11.68
10000	6.16	29.62	6.16	11.08	11.08	32.14	30.25	10.68	10.68
10500	6.43	27.53	6.43	9.89	10.54	29.87	28.11	9.53	9.53
11000	5.94	25.68	5.94	8.70	7.48	27.87	26.23	8.38	8.38
11500	5.20	25.37	5.20	9.91	5.99	27.53	25.91	9.55	9.55
12000	4.58	25.08	4.58	11.12	5.62	27.21	25.61	10.72	10.72
12500	4.06	24.40	4.06	10.97	5.25	26.48	24.92	10.57	10.57
13000	3.97	23.76	3.97	10.81	4.96	25.78	24.27	10.42	10.42
13500	3.57	22.62	3.57	10.45	4.93	24.55	23.10	10.07	10.07
14000	3.26	21.55	3.26	10.09	4.58	23.38	22.01	9.72	9.72
14500	2.98	20.89	2.98	9.24	4.44	22.67	21.33	8.90	8.90
15000	2.81	20.24	2.81	8.38	5.15	21.96	20.67	8.08	8.08
15500	2.77	19.51	2.77	8.17	5.23	21.17	19.92	7.87	7.87
16000	2.63	18.79	2.63	7.96	5.42	20.39	19.19	7.67	7.67
16500	2.62	18.37	2.62	7.60	5.19	19.93	18.76	7.32	7.32
17000	2.49	17.96	2.49	7.24	5.48	19.49	18.34	6.98	6.98
17500	2.43	17.34	2.43	6.84	5.07	18.82	17.71	6.59	6.59
18000	2.37	16.73	2.37	6.43	4.83	18.15	17.09	6.20	6.20
18500	2.24	16.27	2.24	6.41	4.42	17.66	16.62	6.17	6.17
19000	2.19	15.81	2.19	6.38	4.15	17.16	16.15	6.15	6.15
19500	1.94	15.50	1.94	6.77	3.84	16.82	15.83	6.52	6.52
20000	1.75	15.20	1.75	7.15	3.58	16.49	15.52	6.89	6.89
20500	1.75	15.00	1.75	7.12	3.39	16.27	15.31	6.86	6.86
21000	1.72	14.79	1.72	7.09	3.15	16.05	15.11	6.83	6.83
21500	1.72	14.45	1.72	7.03	2.93	15.68	14.75	6.77	6.77
22000	1.79	14.11	1.79	6.97	2.76	15.31	14.41	6.72	6.72
22500	1.82	13.78	1.82	6.87	2.65	14.95	14.07	6.62	6.62
23000	1.86	13.46	1.86	6.76	2.51	14.61	13.75	6.51	6.51
23500	1.89	13.15	1.89	6.69	2.39	14.27	13.43	6.45	6.45
24000	1.92	12.84	1.92	6.62	2.26	13.94	13.12	6.38	6.38
24500	1.95	12.55	1.95	6.52	2.21	13.62	12.81	6.28	6.28
25000	1.99	12.26	1.99	6.41	2.09	13.30	12.52	6.18	6.18
25500	2.02	11.97	2.02	6.19	2.03	12.99	12.23	5.96	5.96
26000	2.05	11.69	2.05	5.97	1.94	12.69	11.94	5.75	5.75
26500	2.04	11.42	2.04	5.94	1.84	12.40	11.67	5.72	5.72
27000	2.07	11.16	2.07	5.91	1.79	12.11	11.40	5.70	5.70
27500	2.11	10.91	2.11	5.88	1.69	11.84	11.14	5.66	5.66
28000	2.12	10.66	2.12	5.84	1.65	11.57	10.89	5.63	5.63
28500	2.14	10.42	2.14	5.77	1.56	11.31	10.65	5.56	5.56
29000	2.14	10.19	2.14	5.70	1.50	11.06	10.41	5.49	5.49
29500	2.15	9.96	2.15	5.64	1.42	10.81	10.17	5.43	5.43
30000	2.15	9.74	2.15	5.57	1.39	10.57	9.95	5.37	5.37
30500	2.18	9.47	2.18	5.59	1.32	10.28	9.68	5.39	5.39
31000	2.27	9.22	2.27	5.61	1.30	10.00	9.42	5.41	5.41
31500	2.32	9.02	2.32	5.57	1.25	9.79	9.21	5.36	5.36
32000	2.35	8.83	2.35	5.52	1.21	9.58	9.02	5.32	5.32
32500	2.38	8.66	2.38	5.48	1.16	9.40	8.85	5.28	5.28
33000	2.39	8.49	2.39	5.43	1.12	9.22	8.68	5.23	5.23
33500	2.41	8.33	2.41	5.40	1.12	9.04	8.51	5.20	5.20
34000	2.42	8.17	2.42	5.36	1.11	8.87	8.35	5.17	5.17
34500	2.42	8.02	2.42	5.33	1.07	8.70	8.19	5.14	5.14
35000	2.43	7.86	2.43	5.30	1.09	8.53	8.03	5.11	5.11

REPRESENTATIVE GROUP V
HAI VALUES (PERCENT)

Qms	101.7L	117.0M	118.9L	124.0M	132.8R	139.0L	139.7R	141.6R	143.0L
5000	11.49	7.42	11.49	12.20	13.64	8.85	12.20	13.40	7.42
5500	11.49	7.42	14.53	12.20	13.64	11.20	12.20	13.40	7.42
6000	11.49	7.42	17.26	12.20	13.64	13.31	12.20	13.40	7.42
6500	11.49	7.42	19.77	12.20	13.64	15.24	12.20	13.40	7.42
7000	11.49	7.42	22.06	12.20	13.64	17.01	12.20	13.40	7.42
7500	11.49	7.42	24.18	12.20	13.64	18.64	12.20	13.40	9.38
8000	11.49	7.42	26.13	12.20	13.64	20.15	12.20	13.40	11.15
8500	11.49	7.42	26.10	12.20	13.64	20.12	12.20	13.40	12.77
9000	11.49	7.42	25.52	12.20	13.64	19.67	12.20	13.40	14.25
9500	11.49	7.42	24.73	12.20	13.64	19.06	12.20	13.40	15.62
10000	11.49	7.42	24.06	12.20	13.64	18.55	12.20	13.40	16.88
10500	14.53	7.42	23.12	12.20	13.64	17.82	12.20	13.40	16.86
11000	17.26	7.42	21.58	12.20	13.64	16.64	12.20	13.40	16.48
11500	19.77	7.42	18.81	12.20	13.64	14.50	12.20	13.40	15.97
12000	22.06	7.42	17.31	12.20	13.64	13.35	12.20	13.40	15.54
12500	24.18	7.42	16.80	12.20	13.64	12.95	12.20	13.40	14.93
13000	26.13	7.42	14.25	12.20	13.64	10.99	12.20	13.40	13.94
13500	26.10	7.42	13.24	12.20	13.64	10.21	12.20	13.40	12.15
14000	25.52	7.42	11.81	12.20	13.64	9.10	12.20	13.40	11.18
14500	24.73	7.42	10.79	12.20	13.64	8.32	12.20	13.40	10.85
15000	24.06	7.42	9.16	12.20	13.64	7.06	12.20	13.40	9.21
15500	23.12	7.42	7.74	12.20	13.64	5.97	12.20	13.40	8.55
16000	21.58	9.38	7.37	12.20	13.64	5.68	12.20	13.40	7.63
16500	18.81	11.15	6.82	12.20	13.64	5.26	12.20	13.40	6.97
17000	17.31	12.77	6.05	12.20	13.64	4.66	12.20	13.40	5.92
17500	16.80	14.25	5.57	12.20	13.64	4.29	12.20	13.40	5.00
18000	14.25	15.62	5.24	12.20	13.64	4.04	12.20	13.40	4.76
18500	13.24	16.88	5.23	12.20	13.64	4.03	12.20	13.40	4.41
19000	11.81	16.86	4.92	12.20	13.64	3.79	12.20	13.40	3.91
19500	10.79	16.48	4.74	12.20	13.64	3.65	12.20	13.40	3.60
20000	9.16	15.97	4.62	12.20	17.25	3.56	12.20	13.40	3.38
20500	7.74	15.54	4.50	12.20	20.50	3.47	12.20	13.40	3.38
21000	7.37	14.93	4.38	12.20	23.47	3.38	12.20	13.40	3.18
21500	6.82	13.94	4.27	12.20	26.20	3.29	12.20	16.95	3.06
22000	6.05	12.15	4.17	12.20	28.72	3.21	12.20	20.14	2.98
22500	5.57	11.18	4.06	12.20	31.03	3.13	15.43	23.06	2.91
23000	5.24	10.85	3.97	12.20	30.99	3.06	18.34	25.74	2.83
23500	5.23	9.21	3.87	15.43	30.30	2.98	21.00	28.21	2.76
24000	4.92	8.55	3.77	18.34	29.37	2.91	23.44	30.49	2.69
24500	4.74	7.63	3.68	21.00	28.57	2.84	25.69	30.45	2.63
25000	4.62	6.97	3.60	23.44	27.45	2.77	27.77	29.77	2.56
25500	4.50	5.92	3.51	25.69	25.63	2.71	27.73	28.85	2.50
26000	4.38	5.00	3.43	27.77	22.33	2.64	27.11	28.07	2.44
26500	4.27	4.76	3.35	27.73	20.56	2.58	26.27	26.97	2.38
27000	4.17	4.41	3.27	27.11	19.95	2.52	25.56	25.18	2.32
27500	4.06	3.91	3.20	26.27	16.93	2.46	24.56	21.94	2.27
28000	3.97	3.60	3.12	25.56	15.73	2.41	22.93	20.20	2.21
28500	3.87	3.38	3.05	24.56	14.03	2.35	19.98	19.60	2.16
29000	3.77	3.38	2.98	22.93	12.81	2.30	18.40	16.63	2.11
29500	3.68	3.18	2.92	19.98	10.88	2.25	17.85	15.45	2.06
30000	3.60	3.06	2.85	18.40	9.19	2.20	15.15	13.78	2.02
30500	3.51	2.98	2.79	17.85	8.75	2.15	14.07	12.59	1.97
31000	3.43	2.91	2.73	15.15	8.10	2.10	12.55	10.69	1.93
31500	3.35	2.83	2.67	14.07	7.19	2.06	11.47	9.03	1.88
32000	3.27	2.76	2.61	12.55	6.62	2.01	9.74	8.60	1.84
32500	3.20	2.69	2.55	11.47	6.22	1.97	8.22	7.96	1.80
33000	3.12	2.63	2.50	9.74	6.21	1.92	7.83	7.06	1.76
33500	3.05	2.56	2.44	8.22	5.84	1.88	7.25	6.50	1.72
34000	2.98	2.50	2.39	7.83	5.63	1.84	6.43	6.11	1.68
34500	2.92	2.44	2.34	7.25	5.48	1.80	5.92	6.10	1.65
35000	2.85	2.38	2.29	6.43	5.34	1.77	5.56	5.74	1.61

REPRESENTATIVE GROUP VI
HAI VALUES (PERCENT)

Qms	102.6L	106.3R	107.1L	117.8L	117.9R	119.7L	133.8L	135.7R	136.3R	138.0L	138.8R	139.5R	140.6R	142.0R
5000	13.58	10.43	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	6.75	6.75	12.01	10.43
5500	13.58	14.30	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	6.75	6.75	12.01	10.43
6000	13.58	17.71	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	6.75	6.75	12.01	10.43
6500	13.58	20.72	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	11.22	6.75	12.01	10.43
7000	18.62	23.41	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	12.17	6.75	12.01	10.43
7500	23.05	25.82	13.58	10.44	10.66	11.10	10.66	6.96	10.63	10.43	13.03	6.75	12.01	10.43
8000	26.97	27.99	13.58	10.44	17.74	11.10	10.66	6.96	10.63	10.43	13.81	6.75	12.01	10.43
8500	30.47	26.15	13.58	17.38	19.24	11.10	10.66	6.96	10.63	14.30	12.39	6.75	12.01	10.43
9000	33.61	24.59	13.58	18.85	20.59	11.10	10.66	6.96	10.63	17.71	13.49	6.75	12.01	10.43
9500	36.44	24.15	13.58	20.17	21.82	11.10	10.66	6.96	10.63	20.72	13.25	11.22	12.01	10.43
10000	34.04	25.14	18.62	21.37	19.58	11.10	10.66	6.96	10.63	23.41	14.52	12.17	12.01	10.43
10500	32.01	24.22	23.05	19.18	21.33	11.10	10.66	6.96	10.63	25.82	14.18	13.03	12.01	10.43
11000	31.45	22.09	26.97	20.89	20.95	11.10	10.66	6.96	10.63	27.99	12.88	13.81	12.01	14.30
11500	32.72	21.06	30.47	20.52	22.95	11.10	10.66	6.96	10.63	26.15	11.92	12.39	12.01	17.71
12000	31.54	20.49	33.61	22.48	22.41	11.10	10.66	6.96	10.63	24.59	11.74	13.49	12.01	20.72
12500	28.76	19.67	36.44	21.96	20.37	11.10	10.66	6.96	10.63	24.15	10.24	13.25	16.46	23.41
13000	27.42	19.25	34.04	19.94	18.85	11.10	10.66	6.96	10.63	25.14	9.52	14.52	20.38	25.82
13500	26.68	18.63	32.01	18.47	18.56	11.10	10.66	6.96	14.57	24.22	8.97	14.18	23.85	27.99
14000	25.61	18.24	31.45	18.18	16.18	11.10	10.66	6.96	18.04	22.09	8.86	12.88	26.94	26.15
14500	25.06	18.00	32.72	15.85	15.04	11.10	10.66	6.96	21.11	21.06	9.97	11.92	29.71	24.59
15000	24.25	17.11	31.54	14.73	14.18	11.10	10.66	6.96	23.85	20.49	9.51	11.74	32.22	24.15
15500	23.74	18.29	28.76	13.89	14.01	11.10	10.66	6.96	26.30	19.67	8.28	10.24	30.09	25.14
16000	23.43	18.17	27.42	13.72	15.75	11.10	10.66	6.96	28.52	19.25	9.23	9.52	28.30	24.22
16500	22.27	17.85	26.68	15.43	15.03	11.10	10.66	6.96	26.64	18.63	8.66	8.97	27.80	22.09
17000	23.82	17.46	25.61	14.72	13.08	11.10	10.66	6.96	25.05	18.24	8.40	8.86	28.93	21.06
17500	23.65	17.14	25.06	12.81	14.60	11.10	17.74	6.96	24.61	18.00	7.99	9.97	27.88	20.49
18000	23.24	16.77	24.25	14.30	13.69	11.10	19.24	6.96	25.61	17.11	7.19	9.51	25.43	19.67
18500	22.73	16.04	23.74	13.41	13.28	11.10	20.59	6.96	24.68	18.29	9.11	8.28	24.24	19.25
19000	22.31	15.40	23.43	13.01	12.63	11.10	21.82	6.96	22.51	18.17	9.53	9.23	23.59	18.63
19500	21.84	14.28	22.27	12.37	11.37	11.10	19.58	6.96	21.46	17.85	9.55	8.66	22.64	18.24
20000	20.88	15.16	23.82	11.13	14.40	11.10	21.33	6.96	20.88	17.46	9.05	8.40	22.15	18.00
20500	20.05	17.73	23.65	14.11	15.07	11.10	20.95	6.96	20.04	17.14	8.53	7.99	21.44	17.11
21000	18.59	17.51	23.24	14.76	15.09	11.10	22.95	6.96	19.61	16.77	8.03	7.19	20.99	18.29
21500	19.74	17.74	22.73	14.78	14.30	11.10	22.42	6.96	18.98	16.04	7.78	9.11	20.72	18.17
22000	23.08	17.64	22.31	14.01	13.49	11.10	20.36	6.96	18.58	15.40	7.46	9.53	19.69	17.85
22500	22.80	17.74	21.84	13.21	12.69	11.10	18.85	6.96	18.34	14.28	6.99	9.55	21.06	17.46
23000	23.09	17.62	20.88	12.43	12.29	11.10	18.56	6.96	17.43	15.16	6.55	9.05	20.91	17.14
23500	22.96	17.50	20.05	12.04	11.80	18.46	16.18	6.96	18.64	17.73	6.31	8.53	20.55	16.77
24000	23.09	17.53	18.59	11.56	11.05	20.02	15.04	6.96	18.51	17.51	6.06	8.03	20.10	16.04
24500	22.94	17.99	19.74	10.82	10.35	21.43	14.18	6.96	18.19	17.74	5.93	7.78	19.72	15.40
25000	22.78	18.16	23.08	10.14	9.97	22.71	14.01	6.96	17.79	17.64	5.79	7.46	19.31	14.28
25500	22.82	18.35	22.80	9.77	9.58	20.38	15.75	6.96	17.46	17.74	5.66	6.99	18.46	15.16
26000	23.42	18.58	23.09	9.38	9.37	22.20	15.03	6.96	17.09	17.62	5.54	6.55	17.72	17.73
26500	23.64	18.87	22.96	9.18	9.16	21.80	13.08	6.96	16.34	17.50	5.41	6.31	16.44	17.51
27000	23.89	19.16	23.09	8.97	8.95	23.89	14.60	6.96	15.69	17.53	5.29	6.06	17.45	17.74
27500	24.19	18.59	22.94	8.77	8.75	23.33	13.69	6.96	14.55	17.99	5.18	5.93	20.40	17.64
28000	24.57	18.07	22.78	8.57	8.56	21.20	13.28	11.58	15.45	18.16	5.06	5.79	20.15	17.74
28500	24.94	17.57	22.82	8.38	8.37	19.62	12.63	12.56	18.06	18.35	4.95	5.66	20.41	17.62
29000	24.20	17.08	23.42	8.20	8.18	19.32	11.36	13.45	17.84	18.58	4.85	5.54	20.30	17.50
29500	23.52	16.62	23.64	8.02	8.00	16.84	14.40	14.25	18.07	18.87	4.74	5.41	20.41	17.53
30000	22.87	16.16	23.89	7.84	7.83	15.66	15.07	12.79	17.97	19.16	4.64	5.29	20.28	17.99
30500	22.24	15.73	24.19	7.67	7.66	14.76	15.09	13.93	18.07	18.59	4.54	5.18	20.14	18.16
31000	21.63	15.31	24.57	7.51	7.50	14.58	14.30	13.68	17.95	18.07	4.45	5.06	20.18	18.35
31500	21.04	14.90	24.94	7.34	7.34	16.39	13.49	14.99	17.83	17.57	4.36	4.95	20.71	18.58
32000	20.48	14.51	24.20	7.19	7.18	15.65	12.69	14.64	17.86	17.08	4.27	4.85	20.90	18.87
32500	19.93	14.13	23.52	7.04	7.03	13.62	12.29	13.30	18.33	16.62	4.18	4.74	21.12	19.16
33000	19.40	13.76	22.87	6.89	6.89	15.19	11.80	12.31	18.50	16.16	4.09	4.64	21.38	18.59
33500	18.89	13.40	22.24	6.74	6.74	14.25	11.05	12.12	18.70	15.73	4.01	4.54	21.72	18.07
34000	18.39	13.06	21.63	6.60	6.60	13.82	10.35	10.57	18.93	15.31	3.93	4.45	22.05	17.57
34500	17.91	12.72	21.04	6.47	6.47	13.14	9.97	9.82	19.23	14.90	3.85	4.36	21.39	17.08
35000	17.45	12.40	20.48	6.33	6.33	11.83	9.58	9.26	19.52	14.51	3.77	4.27	20.79	16.62

REPRESENTATIVE GROUP VII
HAI VALUES (PERCENT)

Qms	114.1R	119.2R	121.1L	123.0L	125.6L	127.5M	131.3L
5000	29.27	18.60	19.51	36.82	49.10	29.27	14.06
5500	29.53	18.60	23.72	37.15	49.54	29.53	14.06
6000	29.83	18.60	27.94	37.53	50.03	29.83	17.10
6500	28.21	18.60	32.16	35.49	47.32	28.21	20.14
7000	26.06	18.60	36.38	32.79	43.72	26.06	23.19
7500	27.72	18.60	40.60	34.87	46.50	27.72	26.22
8000	26.73	22.62	40.97	33.63	44.83	26.73	29.27
8500	24.64	26.64	41.37	31.00	41.33	24.64	29.53
9000	22.82	30.66	39.13	28.71	38.28	22.82	29.83
9500	21.09	34.68	36.15	26.53	35.37	21.09	28.21
10000	18.94	38.71	38.45	23.83	31.77	18.94	26.06
10500	16.81	39.06	37.07	21.15	28.19	16.81	27.72
11000	15.05	39.45	34.18	18.94	25.25	15.05	26.73
11500	13.63	37.31	31.65	17.15	22.87	13.63	24.64
12000	12.04	34.47	29.25	15.14	20.19	12.04	22.82
12500	11.28	36.66	26.27	14.19	18.92	11.28	21.09
13000	10.36	35.35	23.31	13.03	17.38	10.36	18.94
13500	9.28	32.59	20.88	11.68	15.57	9.28	16.81
14000	8.45	30.18	18.91	10.63	14.17	8.45	15.05
14500	7.37	27.89	16.70	9.27	12.37	7.37	13.63
15000	6.47	25.05	15.65	8.14	10.86	6.47	12.04
15500	5.98	22.23	14.37	7.52	10.03	5.98	11.28
16000	5.54	19.91	12.88	6.97	9.30	5.54	10.36
16500	5.15	18.03	11.71	6.47	8.63	5.15	9.28
17000	4.78	15.92	10.23	6.01	8.02	4.78	8.45
17500	4.45	14.92	8.98	5.59	7.46	4.45	7.37
18000	4.14	13.70	8.29	5.21	6.94	4.14	6.47
18500	3.85	12.28	7.69	4.85	6.46	3.85	5.98
19000	3.59	11.17	7.14	4.52	6.03	3.59	5.54
19500	3.35	9.75	6.63	4.22	5.62	3.35	5.15
20000	3.27	8.56	6.17	4.11	5.48	3.27	4.78
20500	3.19	7.91	5.74	4.01	5.35	3.19	4.45
21000	3.11	7.33	5.35	3.92	5.22	3.11	4.14
21500	3.04	6.81	4.98	3.82	5.10	3.04	3.85
22000	2.97	6.32	4.65	3.73	4.98	2.97	3.59
22500	2.90	5.88	4.53	3.65	4.86	2.90	3.35
23000	2.83	5.47	4.42	3.57	4.75	2.83	3.27
23500	2.77	5.10	4.32	3.49	4.65	2.77	3.19
24000	2.71	4.75	4.22	3.41	4.54	2.71	3.11
24500	2.65	4.43	4.12	3.33	4.44	2.65	3.04
25000	2.59	4.32	4.02	3.26	4.35	2.59	2.97
25500	2.54	4.22	3.93	3.19	4.25	2.54	2.90
26000	2.48	4.12	3.84	3.12	4.16	2.48	2.83
26500	2.43	4.02	3.76	3.06	4.07	2.43	2.77
27000	2.38	3.93	3.67	2.99	3.99	2.38	2.71
27500	2.33	3.84	3.59	2.93	3.91	2.33	2.65
28000	2.28	3.75	3.52	2.87	3.83	2.28	2.59
28500	2.23	3.66	3.44	2.81	3.75	2.23	2.54
29000	2.19	3.58	3.37	2.75	3.67	2.19	2.48
29500	2.14	3.50	3.30	2.70	3.60	2.14	2.43
30000	2.10	3.43	3.23	2.64	3.53	2.10	2.38
30500	2.06	3.35	3.16	2.59	3.46	2.06	2.33
31000	2.02	3.28	3.10	2.54	3.39	2.02	2.28
31500	1.98	3.21	3.04	2.49	3.32	1.98	2.23
32000	1.94	3.14	2.97	2.44	3.26	1.94	2.19
32500	1.91	3.08	2.92	2.40	3.20	1.91	2.14
33000	1.87	3.02	2.86	2.35	3.14	1.87	2.10
33500	1.83	2.95	2.80	2.31	3.08	1.83	2.06
34000	1.80	2.89	2.75	2.26	3.02	1.80	2.02
34500	1.77	2.84	2.69	2.22	2.96	1.77	1.98
35000	1.73	2.78	2.64	2.18	2.91	1.73	1.94

REPRESENTATIVE GROUP VIII

HAI VALUES (PERCENT)

Qms	101.3M	102.0L	104.3M	109.5M	112.4L	117.1M	117.2M	118.6M	119.8L	120.0L	121.5R	121.6R	123.2R	124.8R
5000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8500	14.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9000	20.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9500	26.91	10.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10000	26.32	15.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10500	25.74	20.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11000	25.31	19.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11500	24.89	19.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12000	24.40	19.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.95	0.00	0.00	0.00	0.00
12500	23.91	18.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.53	0.00	0.00	0.00	0.00
13000	23.50	18.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.11	0.00	0.00	0.00	0.00
13500	23.09	18.04	0.00	0.00	0.00	0.00	0.00	8.94	0.00	14.78	0.00	0.00	0.00	0.00
14000	21.98	17.73	0.00	0.00	0.00	0.00	0.00	12.97	0.00	14.45	0.00	0.00	0.00	0.00
14500	20.86	17.42	0.00	0.00	0.00	0.00	0.00	17.00	0.00	14.21	0.00	0.00	0.00	0.00
15000	20.21	16.58	0.00	0.00	0.00	7.95	0.00	16.63	12.67	13.97	0.00	14.90	0.00	0.00
15500	19.55	15.74	0.00	0.00	0.00	11.53	0.00	16.25	18.37	13.70	0.00	21.62	0.00	0.00
16000	18.36	15.24	0.00	0.00	0.00	15.11	0.00	15.99	24.08	13.42	0.00	28.33	0.00	0.00
16500	17.18	14.75	0.00	0.00	0.00	14.78	0.00	15.72	23.55	13.19	0.00	27.71	0.00	0.00
17000	15.79	13.85	0.00	0.00	0.00	14.45	0.00	15.41	23.03	12.97	0.00	27.09	0.00	0.00
17500	14.41	12.96	0.00	0.00	0.00	14.21	0.00	15.10	22.65	12.34	0.00	26.65	0.00	0.00
18000	13.58	11.91	0.00	0.00	0.00	13.97	0.00	14.84	22.27	11.71	0.00	26.20	0.00	0.00
18500	12.75	10.87	0.00	0.00	0.00	13.70	0.00	14.59	21.83	11.34	0.00	25.69	0.00	0.00
19000	12.69	10.24	0.00	0.00	0.00	13.42	0.00	13.88	21.39	10.98	0.00	25.17	0.00	0.00
19500	12.63	9.62	0.00	0.00	0.00	13.19	0.00	13.18	21.03	10.31	0.00	24.74	0.00	0.00
20000	11.73	9.57	0.00	0.00	0.00	12.97	0.00	12.76	20.66	9.64	3.44	24.31	0.00	4.95
20500	10.83	9.52	0.00	0.00	0.00	12.34	0.00	12.35	19.66	8.87	5.88	23.14	0.00	8.46
21000	10.44	8.85	0.00	0.00	0.00	11.71	0.00	11.60	18.67	8.09	9.36	21.96	0.00	13.46
21500	10.05	8.17	5.16	0.00	0.00	11.34	0.00	10.85	18.08	7.62	11.65	21.27	0.00	16.75
22000	10.09	7.88	8.82	0.00	0.00	10.98	0.00	9.98	17.49	7.16	14.17	20.58	0.00	20.37
22500	10.13	7.58	14.04	5.27	2.90	10.31	0.00	9.10	16.43	7.12	15.79	19.33	0.00	22.70
23000	9.77	7.61	17.48	9.01	4.96	9.64	0.00	8.58	15.37	7.09	17.10	18.08	0.00	24.57
23500	9.41	7.64	21.25	14.34	7.90	8.87	3.44	8.05	14.13	6.58	18.09	16.63	2.80	26.01
24000	9.07	7.37	23.68	17.84	9.83	8.09	5.88	8.01	12.89	6.08	18.78	15.17	4.78	27.00
24500	8.72	7.10	25.64	21.70	11.95	7.62	9.36	7.97	12.15	5.86	19.42	14.30	7.61	27.92
25000	8.69	6.84	27.14	24.18	13.32	7.16	11.65	7.41	11.41	5.64	19.38	13.42	9.47	27.86
25500	8.66	6.58	28.17	26.18	14.42	7.12	14.17	6.84	11.35	5.66	18.80	13.36	11.51	27.02
26000	8.72	6.56	29.13	27.70	15.27	7.09	15.79	6.59	11.30	5.69	17.64	13.29	12.83	25.35
26500	8.78	6.54	29.08	28.76	15.85	6.58	17.10	6.35	10.49	5.49	16.19	12.35	13.89	23.27
27000	8.60	6.58	28.20	29.74	16.39	6.08	18.09	6.37	9.69	5.29	14.30	11.40	14.70	20.56
27500	8.43	6.62	26.46	29.68	16.36	5.86	18.78	6.40	9.34	5.09	12.35	10.99	15.26	17.76
28000	8.14	6.49	24.28	28.78	15.86	5.64	19.42	6.17	8.99	4.90	10.67	10.58	15.78	15.33
28500	7.86	6.36	21.45	27.01	14.88	5.66	19.38	5.95	9.03	4.88	9.15	10.62	15.75	13.16
29000	8.45	6.14	18.53	24.78	13.66	5.69	18.80	5.73	9.06	4.86	7.95	10.66	15.27	11.43
29500	7.45	5.93	16.00	21.90	12.07	5.49	17.64	5.51	8.74	4.90	6.87	10.29	14.33	9.37
30000	7.33	6.37	13.73	18.91	10.42	5.29	16.19	5.49	8.42	4.93	5.89	9.91	13.15	8.47
30500	7.21	5.62	11.93	16.33	9.00	5.09	14.30	5.47	8.11	4.83	5.03	9.55	11.62	7.23
31000	7.09	5.53	10.30	14.02	7.72	4.90	12.35	5.51	7.80	4.73	4.34	9.18	10.04	6.23
31500	6.97	5.44	8.84	12.18	6.71	4.88	10.67	5.54	7.78	4.57	3.80	9.15	8.67	5.46
32000	6.86	5.35	7.54	10.51	5.79	4.86	9.15	5.43	7.75	4.41	3.36	9.12	7.44	4.83
32500	6.75	5.26	6.50	9.02	4.97	4.90	7.95	5.32	7.80	4.74	2.97	9.18	6.46	4.27
33000	6.64	5.17	5.70	7.70	4.24	4.93	6.87	5.14	7.85	4.19	2.67	9.24	5.58	3.84
33500	6.54	5.09	5.04	6.64	3.66	4.83	5.89	4.96	7.70	4.11	2.39	9.06	4.79	3.43
34000	6.38	5.01	4.46	5.82	3.21	4.73	5.03	5.34	7.54	4.05	2.22	8.87	4.09	3.19
34500	6.22	4.93	4.01	5.14	2.83	4.57	4.34	4.71	7.28	3.98	2.01	8.57	3.52	2.39
35000	6.08	4.82	3.58	4.55	2.51	4.41	3.80	4.63	7.03	3.91	1.87	8.27	3.09	2.69

REPRESENTATIVE GROUP VIII
HAI VALUES (PERCENT)

Qms	125.6R	128.4R	132.5L	135.0R	135.1R	144.0M	145.6R	146.6L
5000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8500	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
9000	0.00	20.17	0.00	0.00	0.00	0.00	0.00	0.00
9500	0.00	26.44	0.00	0.00	0.00	0.00	0.00	0.00
10000	0.00	25.86	0.00	0.00	0.00	0.00	0.00	0.00
10500	0.00	25.28	0.00	0.00	0.00	0.00	0.00	0.00
11000	0.00	24.87	0.00	0.00	0.00	0.00	0.00	0.00
11500	0.00	24.45	0.00	0.00	0.00	0.00	0.00	0.00
12000	0.00	23.97	0.00	0.00	0.00	0.00	0.00	0.00
12500	0.00	23.49	0.00	0.00	0.00	0.00	0.00	0.00
13000	0.00	23.09	0.00	0.00	0.00	0.00	0.00	0.00
13500	0.00	22.69	0.00	0.00	0.00	0.00	0.00	0.00
14000	0.00	21.59	14.15	0.00	0.00	0.00	0.00	0.00
14500	0.00	20.50	20.53	0.00	0.00	0.00	0.00	0.00
15000	0.00	19.85	26.91	0.00	0.00	0.00	0.00	0.00
15500	0.00	19.21	26.32	0.00	0.00	0.00	0.00	0.00
16000	0.00	18.04	25.74	0.00	0.00	0.00	0.00	0.00
16500	0.00	16.87	25.31	0.00	0.00	0.00	0.00	0.00
17000	0.00	15.52	24.89	0.00	0.00	0.00	0.00	0.00
17500	0.00	14.16	24.40	0.00	0.00	0.00	0.00	0.00
18000	0.00	13.34	23.91	0.00	0.00	0.00	0.00	0.00
18500	0.00	12.53	23.50	0.00	0.00	0.00	0.00	0.00
19000	0.00	12.46	23.09	0.00	0.00	0.00	0.00	0.00
19500	0.00	12.40	21.98	0.00	0.00	0.00	0.00	0.00
20000	0.00	11.52	20.86	0.00	0.00	0.00	0.00	0.00
20500	0.00	10.64	20.21	0.00	4.73	0.00	0.00	0.00
21000	0.00	10.26	19.55	0.00	8.09	0.00	0.00	0.00
21500	0.00	9.87	18.36	0.00	12.87	3.33	6.67	0.00
22000	0.00	9.91	17.18	0.00	16.02	5.70	11.40	0.00
22500	0.00	9.95	15.79	0.00	19.48	9.07	18.14	0.00
23000	0.00	9.60	14.41	0.00	21.71	11.29	22.58	0.00
23500	0.00	9.25	13.58	4.73	23.51	13.73	27.45	0.00
24000	0.00	8.91	12.75	8.09	24.88	15.30	30.59	0.00
24500	0.00	8.57	12.69	12.87	25.83	16.56	33.12	0.00
25000	0.00	8.54	12.63	16.02	26.71	17.53	35.06	0.00
25500	0.00	8.51	11.73	19.48	26.65	18.19	36.39	0.00
26000	0.00	8.57	10.83	21.71	25.85	18.82	37.63	0.00
26500	4.73	8.62	10.44	23.51	24.25	18.78	37.56	0.00
27000	8.09	8.45	10.05	24.88	22.26	18.21	36.42	5.16
27500	12.87	8.28	10.09	25.83	19.67	17.09	34.17	8.82
28000	16.02	8.00	10.13	26.71	16.98	15.68	31.36	14.04
28500	19.48	7.72	9.77	26.65	14.67	13.86	27.71	17.48
29000	21.71	8.30	9.41	25.85	12.59	11.97	23.93	21.25
29500	23.51	7.32	9.07	24.25	10.94	10.33	20.66	23.68
30000	24.88	7.20	8.72	22.26	9.44	8.87	17.74	25.64
30500	25.83	7.08	8.69	19.67	8.10	7.71	15.41	27.14
31000	26.71	6.96	8.66	16.98	6.92	6.65	13.30	28.17
31500	26.65	6.85	8.72	14.67	5.96	5.71	11.42	29.13
32000	25.85	6.74	8.78	12.59	5.23	4.87	9.74	29.08
32500	24.25	6.63	8.60	10.94	4.62	4.20	8.40	28.20
33000	22.26	6.53	8.43	9.44	4.09	3.68	7.36	26.46
33500	19.67	6.42	8.14	8.10	3.68	3.25	6.51	24.28
34000	16.98	6.27	7.86	6.92	3.28	2.88	5.76	21.45
34500	14.67	6.11	8.45	5.96	3.06	2.59	5.18	18.53
35000	12.59	5.97	7.45	5.23	2.77	2.31	4.63	16.00

REPRESENTATIVE GROUP IX

HAI VALUES (PERCENT)

Qms	101.5L	104.0R	105.7R	108.9L	109.4R	111.0R	113.8R	117.7L	127.1M	128.3R	129.3L	129.8R	131.2R	135.0L
5000	3.90	4.16	2.73	2.99	3.90	3.03	2.73	3.55	2.73	3.25	3.20	2.89	4.16	4.16
5500	3.94	4.20	2.42	2.65	3.94	3.06	2.42	3.59	2.42	2.87	2.83	2.55	4.20	4.20
6000	4.18	4.46	2.50	2.74	4.18	3.25	2.50	3.81	2.50	2.97	2.93	2.64	4.46	4.46
6500	4.33	4.62	2.44	2.67	4.33	3.37	2.44	3.95	2.44	2.90	2.85	2.57	4.62	4.62
7000	4.39	4.68	2.26	2.47	4.39	3.41	2.26	4.00	2.26	2.69	2.64	2.39	4.68	4.68
7500	4.46	4.76	2.16	2.36	4.46	3.47	2.16	4.06	2.16	2.56	2.52	2.28	4.76	4.76
8000	4.28	4.57	2.21	2.42	4.28	3.33	2.21	3.90	2.21	2.63	2.59	2.34	4.57	4.57
8500	4.57	4.87	2.32	2.54	4.57	3.55	2.32	4.16	2.32	2.76	2.72	2.46	4.87	4.87
9000	5.27	5.62	2.45	2.68	5.27	4.10	2.45	4.80	2.45	2.91	2.86	2.58	5.62	5.62
9500	4.96	5.29	2.28	2.49	4.96	3.86	2.28	4.52	2.28	2.71	2.66	2.41	5.29	5.29
10000	4.96	5.29	2.36	2.58	4.96	3.86	2.36	4.52	2.36	2.81	2.76	2.50	5.29	5.29
10500	4.83	5.15	2.28	2.49	4.83	3.76	2.28	4.40	2.28	2.71	2.66	2.41	5.15	5.15
11000	4.66	4.97	2.33	2.55	4.66	3.62	2.33	4.25	2.33	2.77	2.73	2.47	4.97	4.97
11500	4.35	4.64	2.26	2.47	4.35	3.38	2.26	3.96	2.26	2.69	2.64	2.39	4.64	4.64
12000	4.07	4.34	2.17	2.37	4.07	3.17	2.17	3.71	2.17	2.58	2.53	2.29	4.34	4.34
12500	3.83	4.09	2.33	2.55	3.83	2.98	2.33	3.49	2.33	2.77	2.73	2.47	4.09	4.09
13000	4.16	4.44	2.31	2.52	4.16	3.24	2.31	3.79	2.31	2.74	2.70	2.44	4.44	4.44
13500	4.04	4.31	2.40	2.63	4.04	3.14	2.40	3.68	2.40	2.85	2.81	2.53	4.31	4.31
14000	4.15	4.43	2.57	2.81	4.15	3.23	2.57	3.78	2.57	3.05	3.00	2.71	4.43	4.43
14500	4.04	4.31	2.19	2.39	4.04	3.14	2.19	3.68	2.19	2.60	2.56	2.31	4.31	4.31
15000	3.95	4.21	2.27	2.48	3.95	3.07	2.27	3.60	2.27	2.70	2.65	2.40	4.21	4.21
15500	3.99	4.26	2.40	2.63	3.99	3.10	2.40	3.64	2.40	2.85	2.81	2.53	4.26	4.26
16000	3.77	4.02	2.60	2.85	3.77	2.93	2.60	3.43	2.60	3.09	3.05	2.75	4.02	4.02
16500	3.56	3.80	2.62	2.87	3.56	2.77	2.62	3.24	2.62	3.12	3.07	2.77	3.80	3.80
17000	3.41	3.64	2.32	2.53	3.41	2.65	2.32	3.11	2.32	2.75	2.71	2.45	3.64	3.64
17500	3.53	3.77	2.56	2.80	3.53	2.75	2.56	3.22	2.56	3.04	2.99	2.70	3.77	3.77
18000	3.45	3.68	2.68	2.93	3.45	2.68	2.68	3.14	2.68	3.18	3.13	2.83	3.68	3.68
18500	3.27	3.49	2.88	3.15	3.27	2.54	2.88	2.98	2.88	3.43	3.37	3.05	3.49	3.49
19000	3.61	3.85	2.84	3.10	3.61	2.81	2.84	3.29	2.84	3.37	3.32	3.00	3.85	3.85
19500	3.61	3.85	2.85	3.11	3.61	2.81	2.85	3.29	2.85	3.38	3.33	3.01	3.85	3.85
20000	3.61	3.85	2.74	3.00	3.61	2.81	2.74	3.29	2.74	3.26	3.21	2.90	3.85	3.85
20500	3.61	3.85	2.72	2.97	3.61	2.81	2.72	3.29	2.72	3.23	3.18	2.87	3.85	3.85
21000	4.20	4.48	2.67	2.92	4.20	3.27	2.67	3.83	2.67	3.17	3.12	2.82	4.48	4.48
21500	4.26	4.54	2.78	3.04	4.26	3.31	2.78	3.88	2.78	3.30	3.25	2.94	4.54	4.54
22000	4.37	4.66	2.91	3.18	4.37	3.40	2.91	3.98	2.91	3.46	3.40	3.08	4.66	4.66
22500	4.45	4.75	2.96	3.24	4.45	3.46	2.96	4.05	2.96	3.51	3.46	3.12	4.75	4.75
23000	4.47	4.77	3.05	3.34	4.47	3.48	3.05	4.07	3.05	3.63	3.57	3.22	4.77	4.77
23500	4.47	4.77	3.25	3.55	4.47	3.48	3.25	4.07	3.25	3.86	3.80	3.43	4.77	4.77
24000	4.48	4.78	3.35	3.66	4.48	3.48	3.35	4.08	3.35	3.98	3.92	3.54	4.78	4.78
24500	4.52	4.82	3.37	3.68	4.52	3.52	3.37	4.12	3.37	4.00	3.94	3.56	4.82	4.82
25000	4.57	4.87	3.37	3.68	4.57	3.55	3.37	4.16	3.37	4.00	3.94	3.56	4.87	4.87
25500	4.69	5.00	3.33	3.64	4.69	3.65	3.33	4.27	3.33	3.96	3.89	3.52	5.00	5.00
26000	5.06	5.40	3.32	3.63	5.06	3.94	3.32	4.61	3.32	3.95	3.88	3.51	5.40	5.40
26500	5.14	5.48	3.26	3.57	5.14	4.00	3.26	4.68	3.26	3.88	3.82	3.45	5.48	5.48
27000	5.18	5.53	3.29	3.60	5.18	4.03	3.29	4.72	3.29	3.91	3.85	3.48	5.53	5.53
27500	5.25	5.60	3.34	3.65	5.25	4.08	3.34	4.78	3.34	3.97	3.90	3.53	5.60	5.60
28000	5.25	5.60	3.24	3.54	5.25	4.08	3.24	4.78	3.24	3.85	3.79	3.42	5.60	5.60
28500	5.25	5.60	3.12	3.42	5.25	4.08	3.12	4.78	3.12	3.71	3.65	3.30	5.60	5.60
29000	5.17	5.51	2.99	3.28	5.17	4.02	2.99	4.71	2.99	3.56	3.50	3.16	5.51	5.51
29500	5.05	5.39	2.93	3.21	5.05	3.93	2.93	4.60	2.93	3.48	3.43	3.09	5.39	5.39
30000	4.93	5.26	2.99	3.28	4.93	3.83	2.99	4.49	2.99	3.56	3.50	3.16	5.26	5.26
30500	4.85	5.17	3.38	3.69	4.85	3.77	3.38	4.42	3.38	4.01	3.95	3.57	5.17	5.17
31000	4.73	5.05	3.29	3.60	4.73	3.68	3.29	4.31	3.29	3.91	3.85	3.48	5.05	5.05
31500	4.66	4.97	3.19	3.49	4.66	3.62	3.19	4.25	3.19	3.79	3.73	3.37	4.97	4.97
32000	4.66	4.97	3.22	3.52	4.66	3.62	3.22	4.25	3.22	3.82	3.76	3.40	4.97	4.97
32500	4.57	4.87	3.12	3.42	4.57	3.55	3.12	4.16	3.12	3.71	3.65	3.30	4.87	4.87
33000	4.49	4.79	2.98	3.27	4.49	3.49	2.98	4.09	2.98	3.55	3.49	3.15	4.79	4.79
33500	4.41	4.70	2.88	3.15	4.41	3.43	2.88	4.02	2.88	3.43	3.37	3.05	4.70	4.70
34000	4.32	4.61	2.80	3.06	4.32	3.36	2.80	3.94	2.80	3.33	3.27	2.96	4.61	4.61
34500	4.23	4.51	2.72	2.9[illegible]	4.23	3.29	2.72	3.85	2.72	3.24	3.19	2.88	4.51	4.51
35000	4.17	4.45	2.63	2.88	4.17	3.24	2.63	3.80	2.63	3.13	3.08	2.78	4.45	4.45

REPRESENTATIVE GROUP IX
HAI VALUES (PERCENT)

Qms	139.2R	141.2R	141.3R	142.8R	144.2L	147.1L
5000	3.15	3.56	3.56	2.89	2.73	2.94
5500	2.78	3.15	3.15	2.55	2.42	2.60
6000	2.88	3.26	3.26	2.64	2.50	2.69
6500	2.80	3.17	3.17	2.57	2.44	2.62
7000	2.60	2.94	2.94	2.39	2.26	2.43
7500	2.48	2.81	2.81	2.28	2.16	2.32
8000	2.55	2.88	2.88	2.34	2.21	2.38
8500	2.68	3.03	3.03	2.46	2.32	2.50
9000	2.81	3.18	3.18	2.58	2.45	2.63
9500	2.62	2.97	2.97	2.41	2.28	2.45
10000	2.72	3.07	3.07	2.50	2.36	2.54
10500	2.62	2.97	2.97	2.41	2.28	2.45
11000	2.69	3.04	3.04	2.47	2.33	2.51
11500	2.60	2.94	2.94	2.39	2.26	2.43
12000	2.49	2.82	2.82	2.29	2.17	2.33
12500	2.69	3.04	3.04	2.47	2.33	2.51
13000	2.65	3.00	3.00	2.44	2.31	2.48
13500	2.76	3.12	3.12	2.53	2.40	2.58
14000	2.95	3.34	3.34	2.71	2.57	2.76
14500	2.51	2.84	2.84	2.31	2.19	2.35
15000	2.61	2.95	2.95	2.40	2.27	2.44
15500	2.76	3.12	3.12	2.53	2.40	2.58
16000	3.00	3.39	3.39	2.75	2.60	2.80
16500	3.02	3.41	3.41	2.77	2.62	2.82
17000	2.66	3.01	3.01	2.45	2.32	2.49
17500	2.94	3.33	3.33	2.70	2.56	2.75
18000	3.08	3.49	3.49	2.83	2.68	2.88
18500	3.32	3.75	3.75	3.05	2.88	3.10
19000	3.26	3.69	3.69	3.00	2.84	3.05
19500	3.27	3.70	3.70	3.01	2.85	3.06
20000	3.16	3.57	3.57	2.90	2.74	2.95
20500	3.12	3.53	3.53	2.87	2.72	2.92
21000	3.07	3.47	3.47	2.82	2.67	2.87
21500	3.20	3.62	3.62	2.94	2.78	2.99
22000	3.35	3.79	3.79	3.08	2.91	3.13
22500	3.40	3.85	3.85	3.12	2.96	3.18
23000	3.51	3.97	3.97	3.22	3.05	3.28
23500	3.73	4.22	4.22	3.43	3.25	3.49
24000	3.85	4.36	4.36	3.54	3.35	3.60
24500	3.87	4.38	4.38	3.56	3.37	3.62
25000	3.87	4.38	4.38	3.56	3.37	3.62
25500	3.83	4.33	4.33	3.52	3.33	3.58
26000	3.82	4.32	4.32	3.51	3.32	3.57
26500	3.76	4.25	4.25	3.45	3.26	3.51
27000	3.79	4.29	4.29	3.48	3.29	3.54
27500	3.84	4.35	4.35	3.53	3.34	3.59
28000	3.72	4.21	4.21	3.42	3.24	3.48
28500	3.60	4.07	4.07	3.30	3.12	3.36
29000	3.45	3.90	3.90	3.16	2.99	3.22
29500	3.37	3.81	3.81	3.09	2.93	3.15
30000	3.45	3.90	3.90	3.16	2.99	3.22
30500	3.88	4.39	4.39	3.57	3.38	3.63
31000	3.79	4.29	4.29	3.48	3.29	3.54
31500	3.67	4.15	4.15	3.37	3.19	3.43
32000	3.70	4.19	4.19	3.40	3.22	3.46
32500	3.60	4.07	4.07	3.30	3.12	3.36
33000	3.44	3.89	3.89	3.15	2.98	3.21
33500	3.32	3.75	3.75	3.05	2.88	3.10
34000	3.22	3.64	3.64	2.96	2.80	3.01
34500	3.14	3.55	3.55	2.88	2.72	2.93
35000	3.03	3.43	3.43	2.78	2.63	2.83

APPENDIX C

WETTED SURFACE AREA (WSA) VALUES FOR SPECIFIC AREAS

REPRESENTATIVE GROUP 1
WETTED SURFACE AREA (SQ.FT./10**5)

Qms	102.2L	105.2R	107.6L	108.3L	112.5L	119.4L	120.0R	121.9R	123.1R	123.3R	127.2M	129.4R	133.9L	134.0L
5000	0.046	0.000	0.016	0.023	0.095	0.000	0.040	0.011	.000	0.025	0.004	0.097	0.047	0.014
5500	0.046	0.002	0.016	0.023	0.097	0.000	0.043	0.011	0.002	0.025	0.004	0.097	0.047	0.014
6000	0.046	0.004	0.016	0.023	0.099	0.000	0.045	0.011	0.004	0.025	0.005	0.097	0.047	0.014
6500	0.046	0.006	0.016	0.023	0.101	0.000	0.047	0.011	0.006	0.025	0.005	0.097	0.047	0.014
7000	0.046	0.008	0.016	0.023	0.103	0.000	0.049	0.011	0.008	0.025	0.005	0.097	0.047	0.014
7500	0.046	0.009	0.016	0.023	0.104	0.000	0.051	0.011	0.009	0.025	0.006	0.097	0.047	0.014
8000	0.046	0.011	0.016	0.023	0.106	0.000	0.053	0.011	0.011	0.025	0.006	0.097	0.047	0.014
8500	0.046	0.012	0.016	0.023	0.107	0.000	0.054	0.011	0.012	0.025	0.006	0.097	0.047	0.014
9000	0.046	0.013	0.016	0.023	0.108	0.000	0.056	0.011	0.013	0.025	0.006	0.097	0.047	0.014
9500	0.046	0.015	0.016	0.023	0.110	0.000	0.057	0.011	0.014	0.025	0.007	0.097	0.047	0.014
10000	0.046	0.016	0.016	0.023	0.111	0.000	0.059	0.011	0.016	0.025	0.007	0.097	0.047	0.014
10500	0.046	0.017	0.016	0.023	0.112	0.000	0.060	0.011	0.017	0.025	0.007	0.097	0.047	0.014
11000	0.046	0.018	0.016	0.023	0.113	0.014	0.061	0.011	0.018	0.025	0.007	0.097	0.047	0.014
11500	0.046	0.019	0.016	0.023	0.114	0.015	0.062	0.011	0.019	0.025	0.007	0.097	0.047	0.014
12000	0.046	0.020	0.016	0.023	0.115	0.016	0.064	0.011	0.020	0.025	0.008	0.097	0.047	0.014
12500	0.046	0.021	0.016	0.023	0.116	0.017	0.065	0.011	0.021	0.025	0.030	0.097	0.047	0.014
13000	0.046	0.022	0.016	0.024	0.117	0.018	0.066	0.011	0.021	0.025	0.030	0.097	0.047	0.014
13500	0.046	0.023	0.020	0.024	0.118	0.019	0.067	0.011	0.022	0.025	0.031	0.097	0.047	0.014
14000	0.046	0.024	0.025	0.024	0.119	0.020	0.068	0.011	0.023	0.025	0.031	0.097	0.047	0.014
14500	0.046	0.024	0.030	0.024	0.119	0.021	0.069	0.011	0.024	0.025	0.031	0.097	0.047	0.014
15000	0.046	0.025	0.034	0.024	0.120	0.022	0.070	0.011	0.025	0.025	0.031	0.097	0.047	0.014
15500	0.046	0.026	0.038	0.024	0.121	0.023	0.071	0.011	0.025	0.025	0.032	0.097	0.047	0.014
16000	0.046	0.027	0.042	0.024	0.122	0.023	0.071	0.011	0.026	0.025	0.032	0.097	0.047	0.014
16500	0.046	0.027	0.046	0.024	0.122	0.024	0.072	0.011	0.027	0.030	0.032	0.097	0.047	0.017
17000	0.046	0.028	0.050	0.024	0.123	0.025	0.073	0.011	0.027	0.031	0.032	0.097	0.047	0.017
17500	0.046	0.029	0.054	0.024	0.124	0.025	0.074	0.011	0.028	0.032	0.032	0.097	0.047	0.018
18000	0.046	0.029	0.058	0.024	0.124	0.026	0.075	0.011	0.029	0.033	0.033	0.097	0.047	0.018
18500	0.046	0.030	0.061	0.024	0.125	0.027	0.075	0.011	0.029	0.034	0.033	0.097	0.048	0.019
19000	0.046	0.031	0.065	0.024	0.126	0.027	0.076	0.011	0.030	0.035	0.033	0.097	0.048	0.019
19500	0.046	0.031	0.068	0.024	0.126	0.028	0.077	0.011	0.030	0.036	0.033	0.097	0.049	0.019
20000	0.046	0.032	0.071	0.024	0.127	0.029	0.077	0.011	0.031	0.037	0.033	0.097	0.049	0.020
20500	0.046	0.032	0.075	0.024	0.127	0.029	0.078	0.011	0.031	0.038	0.033	0.097	0.050	0.020
21000	0.046	0.033	0.078	0.024	0.128	0.030	0.079	0.011	0.032	0.039	0.034	0.097	0.050	0.020
21500	0.046	0.033	0.081	0.024	0.128	0.030	0.079	0.011	0.032	0.040	0.034	0.097	0.051	0.021
22000	0.046	0.034	0.084	0.024	0.129	0.031	0.080	0.011	0.033	0.041	0.034	0.097	0.051	0.021
22500	0.046	0.034	0.087	0.024	0.129	0.032	0.081	0.011	0.033	0.041	0.034	0.097	0.051	0.021
23000	0.046	0.035	0.090	0.024	0.130	0.032	0.088	0.011	0.034	0.041	0.034	0.097	0.052	0.022
23500	0.046	0.035	0.092	0.024	0.130	0.033	0.092	0.011	0.034	0.041	0.034	0.097	0.052	0.022
24000	0.046	0.036	0.095	0.024	0.131	0.033	0.096	0.011	0.035	0.041	0.035	0.097	0.053	0.022
24500	0.046	0.036	0.098	0.024	0.131	0.034	0.099	0.011	0.035	0.041	0.035	0.097	0.053	0.022
25000	0.046	0.037	0.100	0.024	0.132	0.034	0.103	0.011	0.036	0.041	0.035	0.097	0.053	0.022
25500	0.046	0.037	0.103	0.024	0.132	0.035	0.106	0.011	0.036	0.041	0.035	0.097	0.054	0.022
26000	0.046	0.038	0.106	0.024	0.133	0.035	0.109	0.011	0.037	0.041	0.035	0.097	0.054	0.022
26500	0.046	0.038	0.108	0.024	0.133	0.035	0.113	0.011	0.037	0.041	0.035	0.097	0.055	0.022
27000	0.046	0.039	0.110	0.024	0.134	0.036	0.116	0.011	0.037	0.041	0.035	0.097	0.055	0.022
27500	0.046	0.039	0.113	0.024	0.134	0.036	0.119	0.011	0.038	0.041	0.036	0.097	0.055	0.022
28000	0.046	0.040	0.115	0.024	0.135	0.037	0.120	0.011	0.038	0.041	0.036	0.097	0.056	0.022
28500	0.046	0.040	0.117	0.024	0.135	0.037	0.120	0.011	0.039	0.041	0.036	0.097	0.056	0.022
29000	0.046	0.040	0.120	0.024	0.135	0.038	0.120	0.011	0.039	0.041	0.036	0.097	0.056	0.022
29500	0.046	0.041	0.122	0.024	0.136	0.038	0.120	0.011	0.039	0.041	0.036	0.097	0.057	0.022
30000	0.046	0.041	0.124	0.024	0.136	0.038	0.120	0.011	0.040	0.041	0.036	0.097	0.057	0.022
30500	0.046	0.041	0.126	0.024	0.136	0.039	0.120	0.011	0.040	0.041	0.036	0.097	0.057	0.022
31000	0.046	0.042	0.128	0.024	0.137	0.039	0.120	0.011	0.041	0.041	0.036	0.097	0.057	0.022
31500	0.046	0.042	0.131	0.024	0.137	0.040	0.120	0.011	0.041	0.041	0.037	0.097	0.058	0.022
32000	0.046	0.043	0.133	0.024	0.138	0.040	0.120	0.011	0.041	0.041	0.037	0.097	0.058	0.022
32500	0.046	0.043	0.135	0.024	0.138	0.040	0.120	0.011	0.042	0.041	0.037	0.097	0.058	0.022
33000	0.046	0.043	0.137	0.024	0.138	0.041	0.120	0.011	0.042	0.041	0.037	0.097	0.059	0.022
33500	0.046	0.044	0.139	0.024	0.139	0.041	0.120	0.011	0.042	0.041	0.037	0.097	0.059	0.022
34000	0.046	0.044	0.140	0.024	0.139	0.041	0.120	0.011	0.043	0.041	0.037	0.097	0.059	0.022
34500	0.046	0.044	0.142	0.024	0.139	0.042	0.120	0.011	0.043	0.041	0.037	0.097	0.060	0.022
35000	0.046	0.045	0.144	0.024	0.140	0.042	0.120	0.011	0.043	0.041	0.037	0.097	0.060	0.022

REPRESENTATIVE GROUP 1
WETTED SURFACE AREA (SQ.FT./10^5)

Qms	135.5R	135.6R	136.9R	139.0L	139.9R
5000	0.041	0.145	0.004	0.021	0.012
5500	0.041	0.147	0.005	0.024	0.012
6000	0.041	0.149	0.006	0.027	0.012
6500	0.041	0.150	0.007	0.030	0.012
7000	0.041	0.152	0.008	0.033	0.012
7500	0.041	0.153	0.009	0.035	0.012
8000	0.041	0.155	0.010	0.038	0.012
8500	0.041	0.156	0.011	0.040	0.012
9000	0.041	0.157	0.011	0.042	0.012
9500	0.041	0.158	0.012	0.044	0.012
10000	0.041	0.159	0.013	0.046	0.012
10500	0.041	0.160	0.013	0.047	0.012
11000	0.041	0.161	0.014	0.049	0.012
11500	0.041	0.162	0.014	0.051	0.012
12000	0.041	0.163	0.015	0.052	0.012
12500	0.041	0.164	0.015	0.054	0.012
13000	0.041	0.165	0.027	0.055	0.012
13500	0.041	0.166	0.031	0.056	0.012
14000	0.041	0.166	0.036	0.058	0.012
14500	0.041	0.167	0.040	0.059	0.012
15000	0.041	0.168	0.044	0.060	0.012
15500	0.041	0.169	0.048	0.061	0.012
16000	0.041	0.169	0.052	0.062	0.012
16500	0.041	0.170	0.056	0.064	0.012
17000	0.041	0.171	0.060	0.065	0.012
17500	0.041	0.171	0.063	0.066	0.012
18000	0.041	0.172	0.067	0.067	0.012
18500	0.041	0.172	0.070	0.068	0.012
19000	0.041	0.173	0.074	0.069	0.012
19500	0.041	0.173	0.077	0.070	0.012
20000	0.041	0.174	0.080	0.071	0.012
20500	0.041	0.174	0.083	0.071	0.012
21000	0.041	0.175	0.086	0.072	0.012
21500	0.041	0.175	0.089	0.073	0.012
22000	0.041	0.176	0.092	0.074	0.012
22500	0.041	0.176	0.095	0.075	0.012
23000	0.041	0.177	0.097	0.076	0.012
23500	0.041	0.177	0.100	0.076	0.013
24000	0.041	0.178	0.103	0.077	0.013
24500	0.041	0.178	0.105	0.078	0.013
25000	0.041	0.179	0.108	0.079	0.013
25500	0.041	0.179	0.110	0.079	0.013
26000	0.041	0.179	0.113	0.080	0.013
26500	0.041	0.180	0.115	0.081	0.013
27000	0.041	0.180	0.117	0.081	0.014
27500	0.041	0.181	0.120	0.082	0.014
28000	0.041	0.181	0.122	0.083	0.014
28500	0.041	0.181	0.124	0.083	0.014
29000	0.041	0.182	0.126	0.084	0.014
29500	0.041	0.182	0.128	0.085	0.014
30000	0.041	0.182	0.130	0.085	0.014
30500	0.041	0.183	0.132	0.086	0.015
31000	0.041	0.183	0.134	0.086	0.015
31500	0.041	0.184	0.136	0.087	0.015
32000	0.041	0.184	0.138	0.087	0.015
32500	0.041	0.184	0.140	0.088	0.015
33000	0.041	0.184	0.142	0.089	0.015
33500	0.041	0.185	0.144	0.089	0.015
34000	0.041	0.185	0.146	0.090	0.015
34500	0.041	0.185	0.148	0.090	0.016
35000	0.041	0.186	0.149	0.091	0.016

REPRESENTATIVE GROUP II
WETTED SURFACE AREA (/10^5)

Qms	100.6R	101.4L	101.8L	113.1R	113.7R	115.6R	117.9L	118.0L	121.8R	122.4R	122.5R	123.6R	125.1R	125.9R
5000	0.041	0.140	0.030	0.000	0.040	0.130	0.000	0.010	0.027	0.000	0.176	0.031	0.000	0.045
5500	0.041	0.143	0.031	0.000	0.040	0.132	0.000	0.010	0.027	0.000	0.177	0.032	0.000	0.046
6000	0.041	0.145	0.032	0.000	0.040	0.135	0.000	0.010	0.027	0.000	0.178	0.033	0.000	0.046
6500	0.041	0.148	0.032	0.000	0.040	0.137	0.000	0.010	0.027	0.000	0.179	0.035	0.000	0.047
7000	0.041	0.150	0.033	0.000	0.040	0.140	0.000	0.010	0.027	0.000	0.180	0.036	0.000	0.047
7500	0.041	0.153	0.034	0.000	0.040	0.142	0.000	0.010	0.027	0.000	0.181	0.037	0.011	0.048
8000	0.041	0.154	0.034	0.000	0.041	0.147	0.007	0.010	0.027	0.000	0.183	0.038	0.034	0.048
8500	0.041	0.155	0.034	0.000	0.041	0.153	0.015	0.010	0.028	0.000	0.184	0.039	0.069	0.049
9000	0.041	0.157	0.035	0.000	0.041	0.158	0.022	0.010	0.028	0.000	0.186	0.041	0.103	0.049
9500	0.041	0.158	0.035	0.000	0.041	0.163	0.029	0.010	0.028	0.000	0.188	0.042	0.137	0.049
10000	0.041	0.159	0.035	0.000	0.041	0.169	0.037	0.010	0.028	0.000	0.190	0.043	0.117	0.050
10500	0.041	0.160	0.035	0.000	0.042	0.174	0.044	0.010	0.028	0.000	0.191	0.044	0.120	0.050
11000	0.041	0.163	0.036	0.000	0.042	0.174	0.047	0.013	0.029	0.000	0.193	0.045	0.125	0.051
11500	0.041	0.165	0.037	0.000	0.042	0.175	0.049	0.015	0.029	0.000	0.195	0.047	0.129	0.053
12000	0.041	0.168	0.037	0.003	0.042	0.175	0.052	0.018	0.029	0.000	0.197	0.048	0.135	0.054
12500	0.041	0.170	0.038	0.003	0.043	0.175	0.054	0.020	0.029	0.000	0.200	0.049	0.150	0.055
13000	0.041	0.171	0.038	0.003	0.043	0.176	0.054	0.020	0.030	0.000	0.202	0.051	0.180	0.056
13500	0.041	0.173	0.039	0.007	0.044	0.176	0.055	0.020	0.030	0.000	0.206	0.054	0.230	0.057
14000	0.041	0.174	0.039	0.007	0.044	0.177	0.055	0.021	0.030	0.000	0.209	0.056	0.266	0.058
14500	0.041	0.176	0.039	0.014	0.045	0.178	0.055	0.021	0.031	0.000	0.213	0.058	0.270	0.059
15000	0.041	0.177	0.039	0.014	0.045	0.179	0.055	0.021	0.031	0.000	0.217	0.060	0.275	0.060
15500	0.041	0.179	0.040	0.014	0.045	0.179	0.056	0.022	0.032	0.000	0.221	0.063	0.280	0.061
16000	0.041	0.180	0.040	0.014	0.046	0.180	0.056	0.022	0.032	0.000	0.226	0.065	0.287	0.062
16500	0.041	0.187	0.041	0.015	0.046	0.185	0.068	0.024	0.033	0.000	0.232	0.066	0.294	0.064
17000	0.041	0.194	0.041	0.015	0.047	0.190	0.080	0.026	0.033	0.000	0.237	0.068	0.301	0.066
17500	0.041	0.200	0.042	0.015	0.048	0.195	0.092	0.028	0.034	0.000	0.244	0.069	0.310	0.068
18000	0.041	0.207	0.042	0.015	0.049	0.200	0.104	0.030	0.035	0.000	0.252	0.070	0.320	0.070
18500	0.041	0.208	0.043	0.015	0.050	0.204	0.109	0.055	0.036	0.006	0.261	0.075	0.331	0.073
19000	0.041	0.210	0.043	0.015	0.050	0.208	0.114	0.057	0.037	0.012	0.271	0.080	0.343	0.075
19500	0.041	0.211	0.045	0.016	0.051	0.212	0.119	0.058	0.038	0.018	0.282	0.084	0.357	0.078
20000	0.041	0.212	0.045	0.016	0.053	0.216	0.124	0.060	0.039	0.024	0.294	0.089	0.372	0.080
20500	0.041	0.213	0.045	0.016	0.054	0.220	0.130	0.062	0.040	0.030	0.309	0.094	0.392	0.083
21000	0.041	0.215	0.046	0.016	0.055	0.224	0.135	0.065	0.042	0.036	0.324	0.099	0.411	0.085
21500	0.041	0.216	0.046	0.017	0.057	0.228	0.140	0.067	0.043	0.042	0.338	0.104	0.429	0.088
22000	0.041	0.220	0.046	0.017	0.059	0.232	0.145	0.070	0.045	0.048	0.351	0.108	0.445	0.090
22500	0.041	0.221	0.047	0.018	0.061	0.236	0.150	0.074	0.047	0.054	0.364	0.113	0.461	0.093
23000	0.041	0.222	0.047	0.018	0.063	0.240	0.155	0.077	0.050	0.060	0.376	0.118	0.476	0.095
23500	0.041	0.234	0.048	0.019	0.066	0.241	0.158	0.081	0.052	0.063	0.387	0.122	0.491	0.095
24000	0.041	0.257	0.048	0.019	0.068	0.242	0.159	0.084	0.054	0.065	0.398	0.127	0.504	0.095
24500	0.042	0.270	0.049	0.020	0.072	0.255	0.161	0.087	0.056	0.067	0.407	0.131	0.516	0.096
25000	0.042	0.274	0.049	0.021	0.075	0.280	0.163	0.090	0.058	0.070	0.415	0.137	0.527	0.096
25500	0.042	0.275	0.050	0.021	0.079	0.295	0.165	0.092	0.060	0.072	0.422	0.142	0.535	0.096
26000	0.042	0.275	0.051	0.022	0.082	0.299	0.167	0.095	0.061	0.075	0.429	0.150	0.543	0.096
26500	0.042	0.276	0.051	0.023	0.085	0.300	0.169	0.097	0.063	0.079	0.434	0.157	0.550	0.097
27000	0.042	0.276	0.052	0.025	0.087	0.301	0.172	0.099	0.064	0.083	0.440	0.164	0.557	0.097
27500	0.043	0.277	0.053	0.026	0.090	0.301	0.174	0.101	0.065	0.087	0.445	0.170	0.564	0.101
28000	0.043	0.278	0.054	0.027	0.092	0.302	0.177	0.102	0.066	0.090	0.449	0.176	0.570	0.111
28500	0.043	0.278	0.055	0.028	0.095	0.302	0.180	0.104	0.067	0.093	0.453	0.182	0.574	0.117
29000	0.043	0.279	0.055	0.029	0.097	0.303	0.183	0.105	0.068	0.096	0.456	0.188	0.578	0.119
29500	0.044	0.280	0.057	0.029	0.098	0.304	0.187	0.106	0.068	0.099	0.459	0.193	0.582	0.119
30000	0.044	0.281	0.058	0.030	0.100	0.305	0.191	0.107	0.069	0.102	0.462	0.197	0.586	0.119
30500	0.044	0.282	0.060	0.031	0.101	0.306	0.196	0.108	0.070	0.105	0.465	0.201	0.589	0.119
31000	0.045	0.284	0.061	0.032	0.102	0.307	0.200	0.109	0.070	0.107	0.466	0.205	0.591	0.119
31500	0.045	0.285	0.062	0.032	0.103	0.308	0.205	0.110	0.071	0.108	0.467	0.208	0.600	0.120
32000	0.045	0.286	0.064	0.033	0.105	0.309	0.210	0.110	0.071	0.110	0.468	0.210	0.600	0.120
32500	0.046	0.288	0.065	0.033	0.105	0.311	0.215	0.111	0.071	0.111	0.469	0.213	0.600	0.120
33000	0.046	0.290	0.067	0.033	0.106	0.313	0.222	0.111	0.072	0.113	0.470	0.216	0.600	0.121
33500	0.046	0.292	0.069	0.034	0.107	0.314	0.227	0.112	0.072	0.114	0.471	0.218	0.601	0.121
34000	0.047	0.294	0.071	0.034	0.107	0.316	0.232	0.112	0.072	0.115	0.471	0.220	0.601	0.121
34500	0.047	0.296	0.072	0.034	0.108	0.318	0.237	0.113	0.072	0.116	0.472	0.221	0.601	0.122
35000	0.048	0.298	0.074	0.035	0.108	0.320	0.242	0.113	0.072	0.117	0.472	0.223	0.601	0.123

REPRESENTATIVE GROUP II
WETTED SURFACE AREA (/10^5)

Qms	126.0R	126.3R	131.8L	133.9R	135.3L	137.5L	137.5R	137.8L	137.9L	140.2R	142.1R	142.2R	143.4L	144.4L
5000	0.498	0.080	0.000	0.088	0.000	0.063	0.035	0.013	0.000	0.058	0.000	0.000	0.000	0.148
5500	0.506	0.081	0.000	0.088	0.000	0.063	0.035	0.014	0.000	0.061	0.000	0.000	0.000	0.148
6000	0.514	0.082	0.000	0.088	0.000	0.063	0.035	0.016	0.000	0.064	0.000	0.000	0.000	0.148
6500	0.521	0.082	0.000	0.088	0.000	0.063	0.036	0.017	0.000	0.066	0.000	0.000	0.000	0.148
7000	0.529	0.083	0.000	0.088	0.000	0.063	0.036	0.019	0.000	0.069	0.000	0.000	0.000	0.149
7500	0.537	0.084	0.000	0.088	0.000	0.063	0.036	0.020	0.000	0.072	0.000	0.000	0.000	0.149
8000	0.539	0.089	0.002	0.088	0.000	0.063	0.036	0.023	0.000	0.074	0.000	0.000	0.002	0.149
8500	0.541	0.095	0.005	0.088	0.000	0.063	0.036	0.026	0.000	0.076	0.000	0.000	0.003	0.149
9000	0.544	0.100	0.007	0.088	0.000	0.063	0.037	0.030	0.000	0.078	0.000	0.000	0.005	0.149
9500	0.546	0.105	0.009	0.088	0.000	0.063	0.037	0.033	0.000	0.080	0.000	0.000	0.007	0.150
10000	0.548	0.111	0.012	0.088	0.000	0.063	0.037	0.036	0.000	0.082	0.000	0.021	0.008	0.150
10500	0.550	0.116	0.014	0.088	0.000	0.063	0.037	0.039	0.000	0.084	0.000	0.021	0.010	0.150
11000	0.567	0.117	0.015	0.088	0.000	0.063	0.038	0.041	0.011	0.087	0.012	0.021	0.015	0.151
11500	0.585	0.118	0.015	0.088	0.000	0.063	0.038	0.042	0.021	0.090	0.022	0.021	0.020	0.151
12000	0.602	0.119	0.015	0.088	0.000	0.063	0.038	0.044	0.031	0.093	0.042	0.021	0.025	0.152
12500	0.619	0.120	0.015	0.088	0.000	0.063	0.039	0.045	0.041	0.096	0.062	0.021	0.030	0.152
13000	0.628	0.143	0.015	0.088	0.002	0.063	0.039	0.047	0.045	0.101	0.064	0.021	0.033	0.153
13500	0.638	0.167	0.015	0.088	0.004	0.063	0.039	0.049	0.046	0.107	0.066	0.021	0.036	0.153
14000	0.647	0.190	0.015	0.088	0.006	0.063	0.040	0.051	0.047	0.112	0.068	0.021	0.039	0.154
14500	0.656	0.214	0.015	0.088	0.009	0.063	0.040	0.053	0.048	0.116	0.070	0.021	0.043	0.155
15000	0.665	0.237	0.015	0.088	0.011	0.063	0.041	0.055	0.049	0.117	0.072	0.021	0.046	0.156
15500	0.675	0.261	0.015	0.088	0.013	0.063	0.042	0.057	0.049	0.118	0.074	0.021	0.049	0.156
16000	0.684	0.284	0.015	0.088	0.015	0.063	0.042	0.059	0.050	0.119	0.076	0.021	0.052	0.157
16500	0.688	0.288	0.016	0.088	0.021	0.063	0.043	0.060	0.052	0.121	0.078	0.022	0.057	0.158
17000	0.692	0.292	0.016	0.088	0.027	0.063	0.044	0.060	0.053	0.122	0.080	0.022	0.061	0.159
17500	0.696	0.296	0.016	0.088	0.033	0.063	0.045	0.061	0.054	0.123	0.082	0.022	0.066	0.160
18000	0.700	0.300	0.016	0.088	0.039	0.064	0.046	0.061	0.056	0.124	0.084	0.022	0.070	0.161
18500	0.708	0.317	0.016	0.088	0.035	0.064	0.047	0.063	0.057	0.126	0.086	0.022	0.083	0.162
19000	0.717	0.334	0.016	0.088	0.040	0.064	0.048	0.064	0.060	0.127	0.088	0.022	0.096	0.163
19500	0.725	0.351	0.017	0.098	0.045	0.064	0.049	0.066	0.062	0.129	0.090	0.022	0.109	0.164
20000	0.733	0.368	0.017	0.088	0.050	0.064	0.051	0.068	0.064	0.131	0.092	0.022	0.122	0.166
20500	0.741	0.385	0.017	0.088	0.059	0.064	0.053	0.070	0.067	0.133	0.094	0.022	0.135	0.167
21000	0.750	0.402	0.017	0.088	0.066	0.065	0.055	0.071	0.070	0.136	0.096	0.022	0.147	0.168
21500	0.758	0.419	0.018	0.088	0.069	0.065	0.057	0.073	0.074	0.138	0.098	0.023	0.160	0.170
22000	0.766	0.436	0.018	0.088	0.071	0.065	0.059	0.075	0.077	0.141	0.100	0.023	0.173	0.171
22500	0.775	0.453	0.018	0.088	0.074	0.066	0.063	0.076	0.080	0.144	0.102	0.023	0.186	0.173
23000	0.783	0.470	0.019	0.088	0.077	0.066	0.066	0.078	0.083	0.147	0.117	0.023	0.199	0.175
23500	0.785	0.471	0.019	0.088	0.081	0.066	0.069	0.078	0.086	0.151	0.117	0.023	0.199	0.177
24000	0.787	0.472	0.020	0.088	0.085	0.067	0.071	0.078	0.088	0.156	0.117	0.023	0.199	0.179
24500	0.786	0.477	0.020	0.088	0.089	0.067	0.074	0.079	0.091	0.161	0.118	0.023	0.199	0.181
25000	0.786	0.481	0.021	0.088	0.092	0.067	0.076	0.079	0.093	0.166	0.119	0.024	0.199	0.184
25500	0.786	0.485	0.022	0.088	0.095	0.068	0.078	0.079	0.095	0.172	0.120	0.024	0.199	0.186
26000	0.786	0.490	0.023	0.088	0.099	0.068	0.081	0.079	0.096	0.179	0.121	0.024	0.199	0.189
26500	0.786	0.495	0.023	0.088	0.102	0.069	0.082	0.079	0.098	0.187	0.122	0.024	0.199	0.192
27000	0.786	0.500	0.024	0.088	0.104	0.069	0.084	0.079	0.099	0.197	0.123	0.024	0.199	0.194
27500	0.786	0.505	0.026	0.088	0.107	0.070	0.086	0.080	0.100	0.206	0.124	0.025	0.199	0.198
28000	0.786	0.512	0.027	0.088	0.109	0.070	0.087	0.080	0.101	0.215	0.125	0.025	0.199	0.201
28500	0.786	0.518	0.028	0.088	0.111	0.071	0.088	0.080	0.102	0.224	0.127	0.025	0.199	0.205
29000	0.786	0.525	0.029	0.088	0.112	0.071	0.089	0.080	0.103	0.232	0.128	0.025	0.199	0.210
29500	0.786	0.532	0.030	0.088	0.114	0.072	0.090	0.080	0.104	0.239	0.130	0.026	0.199	0.216
30000	0.786	0.539	0.031	0.088	0.115	0.073	0.091	0.081	0.105	0.246	0.131	0.026	0.199	0.220
30500	0.786	0.548	0.032	0.089	0.117	0.073	0.092	0.081	0.105	0.253	0.133	0.027	0.200	0.225
31000	0.786	0.556	0.033	0.090	0.118	0.074	0.092	0.081	0.106	0.259	0.135	0.027	0.201	0.231
31500	0.786	0.565	0.034	0.091	0.119	0.075	0.093	0.081	0.106	0.264	0.137	0.027	0.212	0.237
32000	0.786	0.574	0.035	0.092	0.120	0.076	0.094	0.081	0.106	0.269	0.139	0.028	0.232	0.243
32500	0.786	0.585	0.035	0.093	0.120	0.077	0.094	0.082	0.107	0.273	0.141	0.028	0.245	0.250
33000	0.786	0.599	0.036	0.094	0.121	0.078	0.094	0.082	0.107	0.276	0.143	0.029	0.248	0.255
33500	0.791	0.616	0.036	0.094	0.122	0.079	0.095	0.082	0.107	0.280	0.146	0.029	0.249	0.261
34000	0.799	0.629	0.037	0.095	0.122	0.080	0.095	0.082	0.107	0.283	0.148	0.030	0.249	0.266
34500	0.804	0.643	0.037	0.095	0.123	0.081	0.095	0.082	0.108	0.286	0.152	0.031	0.250	0.271
35000	0.811	0.659	0.037	0.000	0.123	0.082	0.095	0.082	0.108	0.288	0.156	0.031	0.250	0.276

REPRESENTATIVE GROUP III
WETTED SURFACE AREA (/10^5)

Qms	100.4R	100.6L	101.2R	101.6L	101.7L	110.4L	115.0R	119.3L	128.5R	128.7R	128.8R	130.2R	130.2L	132.6L
5000	0.109	0.048	0.032	0.057	0.300	0.070	0.086	0.010	0.141	0.070	0.250	0.400	0.015	0.020
5500	0.110	0.050	0.050	0.061	0.300	0.075	0.114	0.011	0.141	0.071	0.250	0.406	0.015	0.025
6000	0.110	0.051	0.069	0.066	0.300	0.081	0.142	0.013	0.142	0.073	0.250	0.412	0.016	0.029
6500	0.111	0.053	0.087	0.071	0.300	0.086	0.169	0.014	0.142	0.074	0.250	0.418	0.016	0.034
7000	0.112	0.054	0.106	0.075	0.300	0.092	0.197	0.016	0.143	0.076	0.250	0.424	0.017	0.038
7500	0.112	0.056	0.124	0.080	0.300	0.097	0.225	0.017	0.143	0.077	0.250	0.430	0.017	0.043
8000	0.113	0.061	0.142	0.081	0.325	0.115	0.250	0.023	0.165	0.090	0.253	0.435	0.026	0.066
8500	0.113	0.066	0.160	0.081	0.350	0.133	0.274	0.029	0.187	0.102	0.255	0.440	0.035	0.090
9000	0.114	0.071	0.178	0.082	0.419	0.151	0.299	0.035	0.210	0.115	0.258	0.445	0.044	0.113
9500	0.114	0.076	0.196	0.083	0.443	0.168	0.324	0.040	0.232	0.128	0.260	0.449	0.052	0.136
10000	0.115	0.081	0.214	0.083	0.466	0.186	0.348	0.046	0.254	0.140	0.263	0.454	0.061	0.136
10500	0.115	0.086	0.232	0.084	0.488	0.204	0.373	0.052	0.276	0.153	0.265	0.459	0.070	0.138
11000	0.116	0.090	0.242	0.086	0.509	0.221	0.464	0.058	0.302	0.161	0.270	0.485	0.072	0.186
11500	0.116	0.093	0.252	0.087	0.529	0.238	0.554	0.064	0.328	0.169	0.276	0.511	0.075	0.188
12000	0.117	0.097	0.262	0.089	0.548	0.255	0.645	0.070	0.353	0.176	0.281	0.537	0.077	0.191
12500	0.117	0.100	0.272	0.090	0.567	0.272	0.735	0.076	0.379	0.184	0.286	0.563	0.079	0.193
13000	0.118	0.107	0.278	0.093	0.584	0.282	0.741	0.077	0.453	0.203	0.330	0.611	0.087	0.208
13500	0.118	0.113	0.285	0.096	0.601	0.292	0.748	0.079	0.526	0.221	0.373	0.660	0.096	0.222
14000	0.126	0.120	0.291	0.099	0.618	0.302	0.754	0.080	0.600	0.240	0.417	0.708	0.104	0.237
14500	0.138	0.126	0.298	0.103	0.633	0.312	0.761	0.082	0.673	0.259	0.460	0.757	0.113	0.251
15000	0.149	0.133	0.304	0.106	0.648	0.322	0.767	0.083	0.747	0.278	0.504	0.805	0.12[illegible]	0.266
15500	0.161	0.139	0.311	0.109	0.663	0.332	0.774	0.085	0.820	0.296	0.547	0.854	0.130	0.280
16000	0.171	0.146	0.317	0.112	0.677	0.342	0.780	0.086	0.894	0.315	0.591	0.902	0.13[illegible]	0.295
16500	0.182	0.147	0.352	0.122	0.691	0.352	0.869	0.089	0.896	0.322	0.618	0.958	0.13[illegible]	0.303
17000	0.192	0.148	0.386	0.133	0.705	0.361	0.958	0.091	0.897	0.329	0.646	1.015	0.13[illegible]	0.310
17500	0.202	0.149	0.421	0.143	0.718	0.371	1.046	0.094	0.899	0.336	0.673	1.071	0.140	0.318
18000	0.211	0.150	0.455	0.153	0.730	0.380	1.135	0.096	0.900	0.343	0.700	1.127	0.141	0.325
18500	0.221	0.151	0.459	0.154	0.743	0.384	1.145	0.098	0.902	0.348	0.758	1.161	0.14[illegible]	0.337
19000	0.230	0.152	0.462	0.156	0.755	0.388	1.154	0.099	0.904	0.352	0.816	1.194	0.14[illegible]	0.348
19500	0.239	0.154	0.466	0.157	0.766	0.392	1.164	0.101	0.906	0.357	0.874	1.228	0.14[illegible]	0.360
20000	0.247	0.155	0.470	0.158	0.778	0.396	1.173	0.102	0.908	0.361	0.932	1.261	0.14[illegible]	0.371
20500	0.256	0.156	0.473	0.160	0.789	0.400	1.183	0.104	0.910	0.366	0.991	1.295	0.14[illegible]	0.383
21000	0.264	0.157	0.477	0.161	0.800	0.404	1.193	0.105	0.911	0.371	1.049	1.328	0.14[illegible]	0.395
21500	0.272	0.158	0.481	0.162	0.810	0.408	1.202	0.107	0.913	0.375	1.107	1.362	0.14[illegible]	0.406
22000	0.280	0.160	0.485	0.163	0.820	0.412	1.212	0.108	0.915	0.380	1.165	1.395	0.14[illegible]	0.418
22500	0.287	0.161	0.488	0.165	0.831	0.416	1.221	0.110	0.917	0.381	1.223	1.429	0.14[illegible]	0.429
23000	0.295	0.168	0.492	0.166	0.840	0.420	1.231	0.111	0.919	0.382	1.240	1.446	0.14[illegible]	0.405
23500	0.302	0.170	0.498	0.171	0.850	0.447	1.238	0.115	1.013	0.383	1.252	1.457	0.15[illegible]	0.412
24000	0.309	0.172	0.505	0.174	0.860	0.453	1.256	0.117	1.032	0.387	1.297	1.485	0.159	0.419
24500	0.316	0.174	0.511	0.176	0.869	0.459	1.275	0.118	1.050	0.391	1.341	1.513	0.161	0.426
25000	0.323	0.176	0.518	0.178	0.878	0.464	1.293	0.120	1.067	0.395	1.385	1.540	0.163	0.433
25500	0.330	0.178	0.525	0.180	0.887	0.470	1.310	0.121	1.085	0.399	1.427	1.566	0.166	0.440
26000	0.336	0.180	0.531	0.182	0.895	0.476	1.328	0.122	1.102	0.403	1.468	1.592	0.168	0.446
26500	0.343	0.182	0.538	0.185	0.904	0.481	1.345	0.124	1.119	0.407	1.509	1.618	0.170	0.453
27000	0.349	0.184	0.544	0.187	0.912	0.487	1.361	0.125	1.135	0.411	1.549	1.643	0.172	0.459
27500	0.355	0.186	0.550	0.189	0.921	0.492	1.378	0.126	1.151	0.414	1.588	1.667	0.174	0.465
28000	0.362	0.187	0.556	0.191	0.929	0.497	1.394	0.127	1.167	0.418	1.627	1.692	0.175	0.472
28500	0.368	0.189	0.562	0.193	0.937	0.502	1.409	0.129	1.183	0.422	1.665	1.715	0.177	0.478
29000	0.374	0.191	0.568	0.195	0.944	0.507	1.425	0.130	1.198	0.425	1.702	1.739	0.179	0.484
29500	0.379	0.192	0.573	0.196	0.952	0.512	1.440	0.131	1.213	0.428	1.738	1.761	0.181	0.489
30000	0.385	0.194	0.579	0.198	0.960	0.517	1.455	0.132	1.228	0.432	1.774	1.784	0.183	0.495
30500	0.391	0.196	0.584	0.200	0.967	0.522	1.470	0.133	1.242	0.435	1.810	1.806	0.185	0.501
31000	0.396	0.197	0.590	0.202	0.974	0.526	1.484	0.134	1.257	0.438	1.844	1.828	0.186	0.506
31500	0.402	0.199	0.595	0.204	0.982	0.531	1.498	0.135	1.271	0.442	1.878	1.849	0.188	0.512
32000	0.407	0.200	0.600	0.205	0.989	0.536	1.512	0.136	1.285	0.445	1.912	1.870	0.190	0.517
32500	0.412	0.202	0.606	0.207	0.996	0.540	1.526	0.137	1.298	0.448	1.945	1.891	0.191	0.522
33000	0.417	0.203	0.611	0.209	1.003	0.544	1.540	0.138	1.312	0.451	1.978	1.912	0.193	0.527
33500	0.423	0.205	0.616	0.211	1.009	0.549	1.553	0.140	1.325	0.454	2.010	1.932	0.194	0.533
34000	0.428	0.206	0.621	0.212	1.016	0.553	1.566	0.141	1.338	0.457	2.042	1.952	0.196	0.538
34500	0.433	0.208	0.625	0.214	1.022	0.557	1.579	0.142	1.351	0.460	2.073	1.971	0.198	0.543
35000	0.437	0.209	0.630	0.215	1.029	0.561	1.592	0.142	1.364	0.463	2.104	1.991	0.199	0.684

REPRESENTATIVE GROUP III
WETTED SURFACE AREA (/10^5)

Qms	133.7R	137.2R	141.4R
5000	0.180	0.116	0.262
5500	0.182	0.117	0.273
6000	0.184	0.118	0.283
6500	0.186	0.120	0.294
7000	0.188	0.121	0.304
7500	0.190	0.122	0.315
8000	0.188	0.140	0.311
8500	0.187	0.157	0.308
9000	0.185	0.175	0.304
9500	0.183	0.192	0.300
10000	0.182	0.210	0.297
10500	0.180	0.227	0.293
11000	0.183	0.315	0.378
11500	0.185	0.340	0.414
12000	0.188	0.358	0.448
12500	0.190	0.401	0.481
13000	0.191	0.406	0.513
13500	0.203	0.411	0.543
14000	0.215	0.416	0.573
14500	0.226	0.420	0.601
15000	0.237	0.425	0.629
15500	0.248	0.430	0.655
16000	0.258	0.435	0.681
16500	0.268	0.447	0.706
17000	0.277	0.460	0.730
17500	0.286	0.472	0.754
18000	0.295	0.484	0.776
18500	0.304	0.494	0.799
19000	0.313	0.503	0.820
19500	0.321	0.513	0.841
20000	0.329	0.522	0.862
20500	0.337	0.531	0.882
21000	0.345	0.541	0.901
21500	0.352	0.550	0.920
22000	0.360	0.560	0.939
22500	0.367	0.569	0.957
23000	0.374	0.579	0.975
23500	0.381	0.627	0.992
24000	0.387	0.601	1.010
24500	0.394	0.612	1.026
25000	0.401	0.623	1.043
25500	0.407	0.634	1.059
26000	0.413	0.646	1.074
26500	0.419	0.658	1.090
27000	0.425	0.670	1.105
27500	0.431	0.682	1.120
28000	0.437	0.695	1.134
28500	0.442	0.708	1.149
29000	0.448	0.721	1.163
29500	0.453	0.734	1.177
30000	0.459	0.748	1.190
30500	0.464	0.761	1.204
31000	0.469	0.776	1.217
31500	0.474	0.790	1.230
32000	0.480	0.804	1.243
32500	0.484	0.819	1.255
33000	0.489	0.834	1.267
33500	0.494	0.850	1.280
34000	0.499	0.865	1.292
34500	0.504	0.881	1.303
35000	0.508	0.898	1.315

REPRESENTATIVE GROUP IV

WETTED SURFACE AREA (/ 10^5)

Qms	100.7R	108.7L	110.8M	111.5R	112.6L	114.0R	116.8R	119.5L	119.6L	121.7R	124.1L	125.2R	127.0M	127.4L
5000	0.675	0.173	0.172	0.738	1.700	1.355	0.360	0.320	1.236	1.169	0.648	1.550	0.213	1.192
5500	0.704	0.177	0.174	0.776	1.742	1.433	0.364	0.336	1.244	1.236	0.676	1.609	0.224	1.209
6000	0.730	0.181	0.175	0.811	1.781	1.504	0.368	0.351	1.252	1.298	0.703	1.664	0.233	1.225
6500	0.754	0.185	0.177	0.843	1.816	1.570	0.371	0.364	1.259	1.354	0.727	1.714	0.242	1.240
7000	0.776	0.188	0.178	0.873	1.849	1.631	0.375	0.376	1.266	1.407	0.749	1.760	0.251	1.253
7500	0.797	0.191	0.180	0.900	1.880	1.688	0.378	0.388	1.272	1.455	0.770	1.804	0.258	1.266
8000	0.816	0.193	0.181	0.926	1.908	1.740	0.380	0.399	1.278	1.501	0.789	1.844	0.266	1.278
8500	0.834	0.196	0.182	0.950	1.935	1.790	0.383	0.409	1.283	1.544	0.807	1.882	0.272	1.289
9000	0.851	0.199	0.183	0.973	1.961	1.837	0.386	0.419	1.288	1.584	0.825	1.918	0.279	1.299
9500	0.868	0.201	0.184	0.994	1.984	1.882	0.388	0.428	1.293	1.622	0.841	1.952	0.285	1.309
10000	0.883	0.203	0.185	1.015	2.007	1.924	0.390	0.436	1.298	1.659	0.856	1.984	0.291	1.318
10500	0.898	0.205	0.186	1.034	2.029	1.964	0.392	0.445	1.302	1.693	0.871	2.014	0.296	1.327
11000	0.912	0.207	0.187	1.053	2.049	2.002	0.394	0.452	1.307	1.726	0.885	2.043	0.301	1.336
11500	0.925	0.209	0.188	1.071	2.069	2.038	0.396	0.460	1.311	1.758	0.898	2.071	0.306	1.344
12000	0.938	0.211	0.188	1.088	2.088	2.073	0.398	0.467	1.314	1.788	0.911	2.098	0.311	1.351
12500	0.950	0.213	0.189	1.104	2.106	2.107	0.400	0.474	1.318	1.816	0.923	2.123	0.316	1.359
13000	0.962	0.214	0.190	1.120	2.123	2.139	0.402	0.480	1.322	1.844	0.935	2.148	0.320	1.366
13500	0.973	0.216	0.191	1.135	2.140	2.170	0.403	0.487	1.325	1.871	0.947	2.172	0.324	1.373
14000	0.984	0.218	0.191	1.149	2.156	2.200	0.405	0.493	1.328	1.897	0.958	2.194	0.328	1.380
14500	0.995	0.219	0.192	1.163	2.172	2.229	0.407	0.499	1.331	1.921	0.968	2.216	0.332	1.386
15000	1.005	0.220	0.193	1.177	2.187	2.257	0.408	0.504	1.334	1.945	0.978	2.237	0.336	1.392
15500	1.015	0.222	0.193	1.190	2.201	2.283	0.410	0.510	1.337	1.969	0.988	2.258	0.340	1.398
16000	1.024	0.223	0.194	1.202	2.215	2.310	0.411	0.515	1.340	1.991	0.998	2.278	0.343	1.404
16500	1.033	0.225	0.195	1.215	2.229	2.335	0.412	0.520	1.343	2.013	1.007	2.297	0.347	1.409
17000	1.042	0.226	0.195	1.227	2.242	2.359	0.414	0.525	1.346	2.034	1.016	2.316	0.350	1.415
17500	1.051	0.227	0.196	1.238	2.255	2.383	0.415	0.530	1.348	2.054	1.025	2.334	0.353	1.420
18000	1.059	0.228	0.196	1.249	2.268	2.406	0.416	0.535	1.351	2.074	1.033	2.352	0.356	1.425
18500	1.068	0.229	0.197	1.260	2.280	2.429	0.417	0.540	1.353	2.094	1.041	2.369	0.359	1.430
19000	1.076	0.231	0.197	1.271	2.292	2.451	0.418	0.544	1.356	2.113	1.050	2.385	0.362	1.435
19500	1.083	0.232	0.198	1.281	2.303	2.472	0.420	0.549	1.358	2.131	1.057	2.402	0.365	1.440
20000	1.091	0.233	0.198	1.291	2.314	2.493	0.421	0.553	1.360	2.149	1.065	2.418	0.368	1.444
20500	1.098	0.234	0.199	1.301	2.325	2.513	0.422	0.557	1.363	2.166	1.072	2.433	0.371	1.449
21000	1.106	0.235	0.199	1.311	2.336	2.533	0.423	0.561	1.365	2.183	1.080	2.448	0.374	1.453
21500	1.113	0.236	0.200	1.320	2.346	2.552	0.424	0.565	1.367	2.200	1.087	2.463	0.376	1.458
22000	1.120	0.237	0.200	1.330	2.356	2.571	0.425	0.569	1.369	2.216	1.094	2.477	0.379	1.462
22500	1.126	0.238	0.200	1.338	2.366	2.589	0.426	0.573	1.371	2.232	1.100	2.491	0.381	1.466
23000	1.133	0.239	0.201	1.347	2.376	2.608	0.427	0.576	1.373	2.248	1.107	2.505	0.384	1.470
23500	1.139	0.240	0.201	1.356	2.386	2.625	0.428	0.580	1.375	2.263	1.113	2.519	0.386	1.474
24000	1.146	0.241	0.202	1.364	2.395	2.642	0.429	0.583	1.377	2.278	1.120	2.532	0.389	1.478
24500	1.152	0.242	0.202	1.372	2.404	2.659	0.430	0.587	1.379	2.292	1.126	2.545	0.391	1.481
25000	1.158	0.242	0.202	1.381	2.413	2.676	0.431	0.590	1.380	2.307	1.132	2.557	0.393	1.485
25500	1.164	0.243	0.203	1.388	2.422	2.692	0.431	0.594	1.382	2.321	1.138	2.570	0.395	1.489
26000	1.170	0.244	0.203	1.396	2.430	2.708	0.432	0.597	1.384	2.334	1.144	2.582	0.398	1.492
26500	1.175	0.245	0.204	1.404	2.439	2.724	0.433	0.600	1.386	2.348	1.150	2.594	0.400	1.496
27000	1.181	0.246	0.204	1.411	2.447	2.739	0.434	0.603	1.387	2.361	1.155	2.605	0.402	1.499
27500	1.187	0.247	0.204	1.419	2.455	2.754	0.435	0.606	1.389	2.374	1.161	2.617	0.404	1.502
28000	1.192	0.247	0.205	1.426	2.463	2.769	0.436	0.609	1.391	2.387	1.166	2.628	0.406	1.506
28500	1.197	0.248	0.205	1.433	2.471	2.784	0.436	0.612	1.392	2.399	1.172	2.639	0.408	1.509
29000	1.203	0.249	0.205	1.440	2.479	2.798	0.437	0.615	1.394	2.411	1.177	2.650	0.410	1.512
29500	1.208	0.250	0.206	1.447	2.486	2.812	0.438	0.618	1.395	2.424	1.182	2.661	0.412	1.515
30000	1.213	0.250	0.206	1.453	2.494	2.826	0.439	0.621	1.397	2.435	1.187	2.671	0.414	1.518
30500	1.218	0.251	0.206	1.460	2.501	2.839	0.439	0.624	1.398	2.447	1.192	2.682	0.415	1.521
31000	1.223	0.252	0.206	1.466	2.508	2.853	0.440	0.626	1.400	2.459	1.197	2.692	0.417	1.524
31500	1.227	0.252	0.207	1.473	2.515	2.866	0.441	0.629	1.401	2.470	1.202	2.702	0.419	1.527
32000	1.232	0.253	0.207	1.479	2.522	2.879	0.441	0.632	1.403	2.481	1.206	2.712	0.421	1.530
32500	1.237	0.254	0.207	1.485	2.529	2.891	0.442	0.634	1.404	2.492	1.211	2.722	0.423	1.533
33000	1.241	0.254	0.208	1.491	2.536	2.904	0.443	0.637	1.405	2.503	1.216	2.731	0.424	1.536
33500	1.246	0.255	0.208	1.497	2.543	2.916	0.443	0.639	1.407	2.513	1.220	2.740	0.426	1.538
34000	1.250	0.256	0.208	1.503	2.549	2.928	0.444	0.642	1.408	2.524	1.225	2.750	0.428	1.541
34500	1.255	0.256	0.209	1.509	2.556	2.940	0.445	0.644	1.409	2.534	1.229	2.759	0.429	1.544
35000	1.259	0.257	0.209	1.515	2.562	2.952	0.445	0.647	1.411	2.544	1.233	2.768	0.431	1.546

REPRESENTATIVE GROUP IV
WETTED SURFACE AREA (10^5)

Q■s	129.5R	131.7L	134.9R	136.0L	139.4L	139.6L	140.4R	144.0R	145.3R
5000	0.391	0.249	1.256	0.040	0.122	0.468	0.337	0.678	0.223
5500	0.411	0.362	1.311	0.042	0.125	0.476	0.348	0.649	0.224
6000	0.428	0.465	1.362	0.044	0.127	0.484	0.358	0.623	0.225
6500	0.445	0.560	1.408	0.046	0.129	0.491	0.368	0.599	0.226
7000	0.460	0.648	1.452	0.048	0.131	0.498	0.377	0.576	0.227
7500	0.474	0.730	1.492	0.049	0.133	0.504	0.385	0.555	0.227
8000	0.487	0.807	1.530	0.051	0.135	0.510	0.392	0.536	0.228
8500	0.500	0.879	1.565	0.052	0.136	0.515	0.400	0.518	0.228
9000	0.512	0.947	1.598	0.053	0.138	0.520	0.406	0.500	0.229
9500	0.523	1.011	1.630	0.054	0.139	0.525	0.413	0.484	0.230
10000	0.533	1.072	1.660	0.056	0.140	0.530	0.419	0.468	0.230
10500	0.543	1.130	1.688	0.057	0.142	0.534	0.425	0.453	0.231
11000	0.553	1.185	1.715	0.058	0.143	0.539	0.430	0.439	0.231
11500	0.562	1.238	1.741	0.059	0.144	0.543	0.436	0.426	0.232
12000	0.570	1.288	1.766	0.060	0.145	0.546	0.441	0.413	0.232
12500	0.579	1.337	1.790	0.061	0.146	0.550	0.446	0.401	0.232
13000	0.587	1.383	1.813	0.061	0.147	0.554	0.450	0.389	0.233
13500	0.595	1.428	1.835	0.062	0.148	0.557	0.455	0.377	0.233
14000	0.602	1.471	1.856	0.063	0.149	0.560	0.459	0.366	0.233
14500	0.609	1.513	1.876	0.064	0.150	0.563	0.463	0.356	0.234
15000	0.616	1.553	1.896	0.065	0.151	0.566	0.467	0.345	0.234
15500	0.623	1.592	1.915	0.065	0.152	0.569	0.471	0.335	0.234
16000	0.629	1.630	1.934	0.066	0.153	0.572	0.475	0.326	0.235
16500	0.636	1.666	1.952	0.067	0.153	0.575	0.479	0.317	0.235
17000	0.642	1.702	1.969	0.067	0.154	0.578	0.482	0.307	0.235
17500	0.648	1.736	1.986	0.068	0.155	0.580	0.486	0.299	0.236
18000	0.654	1.769	2.002	0.069	0.156	0.583	0.489	0.290	0.236
18500	0.659	1.802	2.018	0.069	0.156	0.585	0.492	0.282	0.236
19000	0.665	1.834	2.034	0.070	0.157	0.588	0.495	0.274	0.237
19500	0.670	1.864	2.049	0.070	0.158	0.590	0.499	0.266	0.237
20000	0.675	1.894	2.064	0.071	0.158	0.592	0.502	0.258	0.237
20500	0.680	1.924	2.078	0.071	0.159	0.595	0.504	0.251	0.237
21000	0.685	1.952	2.092	0.072	0.160	0.597	0.507	0.243	0.238
21500	0.690	1.980	2.106	0.072	0.160	0.599	0.510	0.236	0.238
22000	0.695	2.008	2.119	0.073	0.161	0.601	0.513	0.229	0.238
22500	0.699	2.034	2.132	0.073	0.162	0.603	0.516	0.223	0.238
23000	0.704	2.060	2.145	0.074	0.162	0.605	0.518	0.216	0.238
23500	0.708	2.086	2.158	0.074	0.163	0.607	0.521	0.209	0.239
24000	0.713	2.111	2.170	0.075	0.163	0.609	0.523	0.203	0.239
24500	0.717	2.135	2.182	0.075	0.164	0.611	0.526	0.197	0.239
25000	0.721	2.159	2.194	0.076	0.164	0.612	0.528	0.191	0.239
25500	0.725	2.183	2.205	0.076	0.165	0.614	0.530	0.185	0.239
26000	0.729	2.206	2.217	0.077	0.165	0.616	0.533	0.179	0.240
26500	0.733	2.228	2.228	0.077	0.166	0.618	0.535	0.173	0.240
27000	0.737	2.251	2.239	0.077	0.166	0.619	0.537	0.167	0.240
27500	0.740	2.272	2.249	0.078	0.167	0.621	0.539	0.162	0.240
28000	0.744	2.294	2.260	0.078	0.167	0.623	0.542	0.156	0.240
28500	0.748	2.315	2.270	0.079	0.168	0.624	0.544	0.151	0.241
29000	0.751	2.335	2.280	0.079	0.168	0.626	0.546	0.146	0.241
29500	0.755	2.356	2.290	0.079	0.169	0.627	0.548	0.140	0.241
30000	0.758	2.376	2.300	0.080	0.169	0.629	0.550	0.135	0.241
30500	0.762	2.395	2.310	0.080	0.169	0.630	0.552	0.130	0.241
31000	0.765	2.415	2.319	0.081	0.170	0.632	0.554	0.125	0.241
31500	0.768	2.434	2.329	0.081	0.170	0.633	0.556	0.121	0.242
32000	0.772	2.452	2.338	0.081	0.171	0.635	0.557	0.116	0.242
32500	0.775	2.471	2.347	0.082	0.171	0.636	0.559	0.111	0.242
33000	0.778	2.489	2.356	0.082	0.172	0.637	0.561	0.107	0.242
33500	0.781	2.507	2.364	0.082	0.172	0.639	0.563	0.102	0.242
34000	0.784	2.524	2.373	0.083	0.172	0.640	0.565	0.097	0.242
34500	0.787	2.542	2.382	0.083	0.173	0.641	0.566	0.093	0.242
35000	0.790	2.559	2.390	0.083	0.173	0.643	0.568	0.089	0.243

REPRESENTATIVE GROUP V
WETTED SURFACE AREA (/10^5)

Qms	101.7L	117.0M	118.9L	124.0M	132.8R	139.0L	139.7R	141.6R	143.0L
5000	0.000	0.000	0.000	0.010	0.021	0.007	0.007	0.105	0.019
5500	0.059	0.000	0.000	0.012	0.021	0.011	0.007	0.105	0.019
6000	0.119	0.000	0.000	0.014	0.021	0.015	0.007	0.105	0.019
6500	0.178	0.000	0.000	0.015	0.021	0.019	0.007	0.105	0.019
7000	0.238	0.000	0.000	0.017	0.021	0.022	0.007	0.105	0.020
7500	0.297	0.000	0.000	0.019	0.021	0.025	0.007	0.105	0.020
8000	0.323	0.002	0.000	0.021	0.021	0.028	0.007	0.105	0.028
8500	0.348	0.003	0.000	0.023	0.021	0.031	0.007	0.105	0.034
9000	0.374	0.005	0.000	0.025	0.022	0.034	0.007	0.105	0.041
9500	0.399	0.007	0.000	0.026	0.022	0.036	0.007	0.105	0.047
10000	0.425	0.008	0.000	0.028	0.022	0.039	0.007	0.105	0.053
10500	0.450	0.010	0.000	0.030	0.022	0.041	0.007	0.105	0.058
11000	0.463	0.016	0.000	0.036	0.022	0.043	0.007	0.105	0.064
11500	0.475	0.021	0.000	0.041	0.023	0.045	0.007	0.105	0.069
12000	0.488	0.027	0.000	0.046	0.023	0.047	0.007	0.105	0.073
12500	0.500	0.032	0.000	0.052	0.023	0.049	0.007	0.105	0.078
13000	0.503	0.041	0.000	0.059	0.026	0.051	0.007	0.105	0.082
13500	0.506	0.049	0.000	0.067	0.028	0.052	0.007	0.105	0.087
14000	0.509	0.058	0.000	0.074	0.031	0.054	0.007	0.105	0.091
14500	0.512	0.067	0.000	0.081	0.034	0.056	0.007	0.105	0.095
15000	0.515	0.076	0.000	0.088	0.037	0.057	0.007	0.105	0.099
15500	0.518	0.084	0.000	0.096	0.039	0.059	0.007	0.105	0.102
16000	0.521	0.093	0.000	0.103	0.042	0.060	0.007	0.105	0.106
16500	0.516	0.147	0.000	0.117	0.043	0.062	0.007	0.105	0.109
17000	0.511	0.202	0.000	0.130	0.044	0.063	0.007	0.105	0.113
17500	0.505	0.256	0.000	0.144	0.044	0.064	0.007	0.105	0.116
18000	0.500	0.310	0.000	0.157	0.045	0.066	0.007	0.105	0.119
18500	0.496	0.313	0.000	0.194	0.048	0.067	0.007	0.105	0.122
19000	0.491	0.316	0.000	0.231	0.052	0.068	0.007	0.105	0.125
19500	0.487	0.320	0.000	0.268	0.055	0.069	0.007	0.105	0.128
20000	0.482	0.323	0.000	0.305	0.058	0.071	0.007	0.105	0.131
20500	0.478	0.326	0.000	0.342	0.061	0.072	0.007	0.105	0.134
21000	0.474	0.329	0.000	0.378	0.065	0.073	0.007	0.105	0.137
21500	0.469	0.332	0.000	0.415	0.068	0.074	0.007	0.196	0.139
22000	0.465	0.336	0.000	0.452	0.071	0.075	0.007	0.203	0.142
22500	0.460	0.339	0.000	0.489	0.075	0.076	0.007	0.210	0.144
23000	0.456	0.342	0.000	0.526	0.078	0.077	0.026	0.217	0.147
23500	0.468	0.351	0.000	0.540	0.080	0.078	0.026	0.223	0.149
24000	0.481	0.361	0.000	0.555	0.082	0.079	0.026	0.229	0.152
24500	0.494	0.370	0.000	0.570	0.084	0.080	0.026	0.235	0.154
25000	0.507	0.380	0.000	0.585	0.087	0.081	0.026	0.241	0.156
25500	0.521	0.390	0.000	0.601	0.089	0.082	0.026	0.248	0.159
26000	0.535	0.401	0.000	0.617	0.091	0.083	0.026	0.254	0.161
26500	0.549	0.412	0.000	0.633	0.094	0.084	0.026	0.261	0.163
27000	0.564	0.423	0.000	0.650	0.096	0.084	0.026	0.268	0.165
27500	0.579	0.434	0.000	0.668	0.099	0.085	0.026	0.275	0.167
28000	0.594	0.446	0.000	0.686	0.102	0.086	0.026	0.283	0.169
28500	0.610	0.458	0.000	0.704	0.104	0.087	0.026	0.290	0.171
29000	0.627	0.470	0.000	0.723	0.107	0.088	0.026	0.298	0.173
29500	0.644	0.483	0.000	0.742	0.110	0.088	0.026	0.306	0.175
30000	0.661	0.496	0.000	0.762	0.113	0.089	0.026	0.315	0.177
30500	0.679	0.509	0.000	0.783	0.116	0.090	0.026	0.323	0.179
31000	0.697	0.523	0.000	0.804	0.119	0.091	0.026	0.332	0.181
31500	0.716	0.537	0.000	0.826	0.122	0.091	0.026	0.341	0.182
32000	0.735	0.551	0.000	0.848	0.126	0.092	0.026	0.350	0.184
32500	0.755	0.566	0.000	0.870	0.129	0.093	0.026	0.359	0.186
33000	0.775	0.581	0.000	0.894	0.133	0.094	0.026	0.369	0.188
33500	0.796	0.597	0.000	0.918	0.136	0.094	0.026	0.379	0.189
34000	0.817	0.613	0.000	0.943	0.140	0.095	0.026	0.389	0.191
34500	0.839	0.629	0.000	0.968	0.144	0.096	0.026	0.399	0.193
35000	0.862	0.646	0.000	0.994	0.147	0.096	0.026	0.410	0.194

REPRESENTATIVE GROUP VI
WETTED SURFACE AREA (/10^6)

Qms	102.6L	106.3R	107.1L	117.8L	117.9R	119.7L	133.8L	135.7R	136.3R	138.0R	138.8R	139.5R	140.6R	142.0R
5000	0.143	0.092	0.012	0.040	0.030	0.025	0.242	0.020	0.163	0.000	0.008	0.110	0.000	0.066
5500	0.143	0.098	0.012	0.043	0.031	0.025	0.242	0.022	0.163	0.000	0.026	0.114	0.000	0.080
6000	0.143	0.104	0.012	0.046	0.032	0.025	0.242	0.024	0.163	0.000	0.044	0.117	0.000	0.095
6500	0.144	0.109	0.012	0.050	0.033	0.025	0.242	0.025	0.163	0.000	0.063	0.121	0.000	0.109
7000	0.169	0.114	0.012	0.053	0.034	0.025	0.242	0.027	0.163	0.000	0.081	0.124	0.000	0.124
7500	0.191	0.118	0.012	0.056	0.035	0.025	0.242	0.029	0.163	0.000	0.099	0.128	0.000	0.138
8000	0.211	0.122	0.012	0.067	0.035	0.025	0.242	0.031	0.163	0.007	0.099	0.140	0.002	0.144
8500	0.230	0.126	0.012	0.078	0.036	0.025	0.242	0.033	0.163	0.015	0.099	0.152	0.003	0.150
9000	0.247	0.130	0.012	0.090	0.036	0.025	0.242	0.035	0.163	0.022	0.100	0.164	0.005	0.157
9500	0.264	0.133	0.012	0.101	0.036	0.025	0.242	0.036	0.163	0.029	0.100	0.176	0.006	0.163
10000	0.279	0.136	0.012	0.112	0.037	0.025	0.242	0.038	0.163	0.037	0.100	0.188	0.007	0.169
10500	0.294	0.140	0.012	0.123	0.037	0.025	0.242	0.040	0.163	0.044	0.100	0.200	0.009	0.175
11000	0.307	0.143	0.012	0.135	0.037	0.025	0.242	0.045	0.163	0.074	0.105	0.224	0.088	0.198
11500	0.320	0.145	0.012	0.147	0.038	0.025	0.242	0.050	0.163	0.104	0.110	0.248	0.167	0.221
12000	0.333	0.148	0.012	0.158	0.038	0.025	0.242	0.055	0.163	0.133	0.114	0.272	0.246	0.243
12500	0.345	0.151	0.012	0.170	0.038	0.025	0.242	0.060	0.163	0.163	0.119	0.296	0.325	0.266
13000	0.356	0.153	0.012	0.173	0.038	0.026	0.242	0.060	0.163	0.167	0.117	0.314	0.330	0.279
13500	0.367	0.156	0.034	0.177	0.039	0.026	0.242	0.060	0.174	0.172	0.116	0.332	0.336	0.293
14000	0.377	0.158	0.070	0.180	0.039	0.027	0.242	0.060	0.186	0.176	0.114	0.350	0.341	0.306
14500	0.387	0.160	0.104	0.184	0.040	0.028	0.242	0.060	0.197	0.181	0.113	0.369	0.347	0.320
15000	0.397	0.162	0.136	0.187	0.040	0.029	0.242	0.060	0.208	0.185	0.111	0.387	0.352	0.333
15500	0.406	0.165	0.167	0.191	0.041	0.029	0.242	0.060	0.219	0.190	0.110	0.405	0.358	0.347
16000	0.415	0.167	0.196	0.194	0.041	0.030	0.242	0.060	0.231	0.194	0.108	0.423	0.363	0.360
16500	0.423	0.169	0.224	0.196	0.043	0.033	0.242	0.060	0.231	0.196	0.111	0.455	0.372	0.426
17000	0.432	0.170	0.251	0.197	0.046	0.035	0.242	0.060	0.251	0.197	0.114	0.486	0.382	0.492
17500	0.440	0.172	0.276	0.199	0.048	0.038	0.242	0.060	0.254	0.199	0.117	0.518	0.391	0.557
18000	0.448	0.174	0.301	0.200	0.050	0.040	0.255	0.060	0.257	0.200	0.120	0.549	0.400	0.623
18500	0.455	0.176	0.325	0.206	0.052	0.041	0.268	0.060	0.259	0.202	0.121	0.563	0.417	0.633
19000	0.463	0.178	0.347	0.212	0.054	0.041	0.281	0.061	0.269	0.205	0.122	0.578	0.435	0.648
19500	0.470	0.179	0.369	0.219	0.056	0.042	0.304	0.061	0.277	0.207	0.123	0.592	0.452	0.660
20000	0.477	0.181	0.391	0.225	0.058	0.042	0.314	0.062	0.283	0.210	0.124	0.606	0.470	0.673
20500	0.483	0.182	0.411	0.231	0.060	0.043	0.332	0.062	0.291	0.212	0.125	0.621	0.487	0.685
21000	0.490	0.184	0.431	0.237	0.063	0.043	0.340	0.062	0.295	0.214	0.126	0.635	0.504	0.697
21500	0.496	0.185	0.451	0.243	0.065	0.044	0.347	0.063	0.306	0.217	0.127	0.649	0.522	0.710
22000	0.503	0.187	0.469	0.250	0.067	0.044	0.358	0.063	0.311	0.219	0.128	0.663	0.539	0.722
22500	0.509	0.188	0.488	0.256	0.069	0.045	0.366	0.064	0.317	0.222	0.129	0.678	0.557	0.735
23000	0.515	0.190	0.505	0.262	0.071	0.045	0.378	0.064	0.323	0.224	0.130	0.692	0.574	0.747
23500	0.521	0.191	0.522	0.270	0.073	0.046	0.402	0.066	0.329	0.231	0.134	0.712	0.591	0.769
24000	0.526	0.192	0.539	0.278	0.075	0.048	0.424	0.068	0.334	0.237	0.138	0.733	0.608	0.791
24500	0.532	0.194	0.555	0.286	0.077	0.049	0.453	0.070	0.339	0.244	0.142	0.754	0.626	0.814
25000	0.537	0.195	0.571	0.294	0.080	0.050	0.488	0.072	0.345	0.251	0.146	0.776	0.644	0.838
25500	0.543	0.196	0.587	0.303	0.082	0.052	0.528	0.074	0.350	0.259	0.150	0.799	0.663	0.863
26000	0.548	0.198	0.602	0.311	0.084	0.053	0.577	0.076	0.355	0.266	0.154	0.822	0.682	0.888
26500	0.553	0.199	0.617	0.320	0.087	0.055	0.600	0.078	0.360	0.274	0.159	0.846	0.702	0.914
27000	0.558	0.200	0.631	0.330	0.089	0.057	0.610	0.081	0.366	0.282	0.164	0.871	0.723	0.940
27500	0.563	0.201	0.645	0.339	0.092	0.058	0.626	0.083	0.392	0.290	0.168	0.897	0.744	0.968
28000	0.568	0.202	0.659	0.349	0.095	0.060	0.635	0.085	0.395	0.299	0.173	0.923	0.765	0.996
28500	0.573	0.203	0.673	0.360	0.097	0.062	0.645	0.088	0.399	0.307	0.178	0.950	0.788	1.025
29000	0.577	0.205	0.686	0.370	0.100	0.064	0.710	0.090	0.403	0.316	0.184	0.977	0.811	1.055
29500	0.582	0.206	0.699	0.381	0.103	0.065	0.764	0.093	0.406	0.326	0.189	1.006	0.834	1.086
30000	0.586	0.207	0.712	0.392	0.106	0.067	0.798	0.096	0.410	0.335	0.194	1.035	0.859	1.118
30500	0.591	0.208	0.724	0.403	0.109	0.069	0.807	0.099	0.414	0.345	0.200	1.065	0.884	1.150
31000	0.595	0.209	0.736	0.415	0.113	0.071	0.814	0.101	0.418	0.355	0.206	1.097	0.910	1.184
31500	0.599	0.210	0.748	0.427	0.116	0.073	0.820	0.104	0.422	0.365	0.212	1.129	0.936	1.218
32000	0.604	0.211	0.760	0.440	0.119	0.076	0.827	0.107	0.426	0.376	0.218	1.162	0.963	1.254
32500	0.608	0.212	0.771	0.453	0.123	0.078	0.837	0.111	0.430	0.387	0.225	1.195	0.992	1.290
33000	0.612	0.213	0.783	0.466	0.126	0.080	0.846	0.114	0.434	0.398	0.231	1.230	1.021	1.328
33500	0.616	0.214	0.794	0.479	0.130	0.082	0.848	0.117	0.438	0.410	0.238	1.266	1.050	1.367
34000	0.620	0.215	0.805	0.493	0.134	0.085	0.851	0.121	0.443	0.422	0.245	1.303	1.081	1.407
34500	0.624	0.216	0.815	0.508	0.138	0.087	0.854	0.124	0.447	0.434	0.252	1.341	1.113	1.448
35000	0.628	0.217	0.826	0.523	0.142	0.090	0.856	0.128	0.451	0.447	0.259	1.380	1.145	1.490

REPRESENTATIVE GROUP VII
WETTED SURFACE AREA (SQ.FT./10^5)

	114.1R	119.2R	121.1L	123.0L	125.6L	127.5M	131.3L
5000	0.269	0.100	0.060	0.036	0.139	0.285	0.050
5500	0.283	0.104	0.067	0.038	0.142	0.299	0.054
6000	0.296	0.108	0.074	0.040	0.146	0.312	0.059
6500	0.308	0.112	0.080	0.042	0.149	0.323	0.063
7000	0.319	0.116	0.087	0.044	0.151	0.334	0.068
7500	0.329	0.120	0.094	0.046	0.154	0.344	0.072
8000	0.339	0.133	0.100	0.048	0.157	0.353	0.086
8500	0.348	0.145	0.114	0.049	0.159	0.362	0.097
9000	0.357	0.158	0.138	0.051	0.161	0.370	0.109
9500	0.365	0.171	0.161	0.052	0.163	0.378	0.120
10000	0.373	0.193	0.183	0.053	0.165	0.385	0.132
10500	0.380	0.201	0.203	0.054	0.167	0.392	0.162
11000	0.387	0.209	0.223	0.056	0.169	0.399	0.191
11500	0.394	0.217	0.242	0.057	0.170	0.405	0.219
12000	0.400	0.224	0.260	0.058	0.172	0.412	0.246
12500	0.406	0.231	0.277	0.059	0.173	0.417	0.271
13000	0.412	0.238	0.293	0.060	0.175	0.423	0.296
13500	0.418	0.245	0.309	0.061	0.176	0.429	0.320
14000	0.423	0.251	0.325	0.062	0.178	0.434	0.342
14500	0.428	0.257	0.340	0.063	0.179	0.439	0.364
15000	0.433	0.263	0.354	0.063	0.180	0.444	0.385
15500	0.438	0.269	0.368	0.064	0.182	0.448	0.406
16000	0.443	0.274	0.381	0.065	0.183	0.453	0.426
16500	0.448	0.280	0.394	0.066	0.184	0.457	0.445
17000	0.452	0.285	0.407	0.067	0.185	0.462	0.464
17500	0.456	0.290	0.419	0.067	0.186	0.466	0.482
18000	0.461	0.295	0.431	0.068	0.187	0.470	0.500
18500	0.465	0.300	0.442	0.069	0.188	0.474	0.517
19000	0.469	0.304	0.454	0.069	0.189	0.478	0.533
19500	0.473	0.309	0.465	0.070	0.190	0.481	0.550
20000	0.477	0.313	0.475	0.071	0.191	0.485	0.566
20500	0.480	0.318	0.486	0.071	0.192	0.489	0.581
21000	0.484	0.322	0.496	0.072	0.193	0.492	0.596
21500	0.487	0.326	0.506	0.072	0.194	0.496	0.611
22000	0.491	0.330	0.515	0.073	0.195	0.499	0.625
22500	0.494	0.334	0.525	0.074	0.196	0.502	0.639
23000	0.497	0.338	0.534	0.074	0.197	0.505	0.653
23500	0.501	0.341	0.543	0.075	0.197	0.508	0.667
24000	0.504	0.345	0.552	0.075	0.198	0.511	0.680
24500	0.507	0.349	0.561	0.076	0.199	0.514	0.693
25000	0.510	0.352	0.569	0.076	0.200	0.517	0.705
25500	0.513	0.355	0.578	0.077	0.201	0.520	0.718
26000	0.516	0.359	0.586	0.077	0.201	0.523	0.730
26500	0.519	0.362	0.594	0.078	0.202	0.526	0.742
27000	0.522	0.365	0.602	0.078	0.203	0.528	0.753
27500	0.524	0.369	0.610	0.079	0.203	0.531	0.765
28000	0.527	0.372	0.617	0.079	0.204	0.534	0.776
28500	0.530	0.375	0.625	0.079	0.205	0.536	0.787
29000	0.532	0.378	0.632	0.080	0.205	0.539	0.798
29500	0.535	0.381	0.639	0.080	0.206	0.541	0.809
30000	0.537	0.384	0.646	0.081	0.207	0.543	0.819
30500	0.540	0.387	0.653	0.081	0.207	0.546	0.830
31000	0.542	0.389	0.660	0.082	0.208	0.548	0.840
31500	0.545	0.392	0.667	0.082	0.209	0.551	0.850
32000	0.547	0.395	0.674	0.082	0.209	0.553	0.860
32500	0.549	0.398	0.680	0.083	0.210	0.555	0.870
33000	0.552	0.400	0.687	0.083	0.210	0.557	0.879
33500	0.554	0.403	0.693	0.083	0.211	0.559	0.888
34000	0.556	0.406	0.699	0.084	0.211	0.562	0.898
34500	0.558	0.408	0.705	0.084	0.212	0.564	0.907
35000	0.560	0.411	0.711	0.085	0.213	0.566	0.916

REPRESENTATIVE GROUP VIII

WETTED SURFACE AREA (SQ.FT./10^5)

Qms	101.3M	102.0L	104.3M	109.5M	112.4L	117.1M	117.2M	118.6M	119.8L	120.0L	121.5R	121.6R	123.2R	124.8R
5000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.045	0.000	0.000	0.010	0.000
5500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.050	0.000	0.000	0.012	0.000
6000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.053	0.000	0.000	0.013	0.000
6500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.057	0.000	0.000	0.015	0.000
7000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.060	0.000	0.000	0.016	0.000
7500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.064	0.000	0.000	0.018	0.000
8000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.066	0.000	0.000	0.019	0.000
8500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.069	0.000	0.000	0.020	0.000
9000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.072	0.000	0.000	0.021	0.000
9500	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.074	0.000	0.000	0.022	0.000
10000	0.032	0.063	0.000	0.000	0.000	0.000	0.000	0.012	0.000	0.076	0.000	0.000	0.023	0.000
10500	0.037	0.067	0.000	0.000	0.000	0.000	0.000	0.012	0.000	0.079	0.000	0.000	0.024	0.005
11000	0.041	0.070	0.000	0.000	0.000	0.018	0.000	0.013	0.000	0.081	0.000	0.000	0.025	0.011
11500	0.046	0.074	0.000	0.000	0.000	0.036	0.000	0.014	0.000	0.083	0.000	0.000	0.026	0.017
12000	0.050	0.077	0.000	0.000	0.000	0.053	0.000	0.014	0.000	0.085	0.000	0.000	0.026	0.022
12500	0.054	0.080	0.000	0.000	0.000	0.071	0.000	0.015	0.000	0.087	0.000	0.000	0.027	0.028
13000	0.058	0.083	0.000	0.000	0.000	0.100	0.000	0.015	0.000	0.082	0.000	0.000	0.028	0.033
13500	0.062	0.086	0.000	0.000	0.000	0.128	0.000	0.016	0.000	0.082	0.000	0.000	0.029	0.038
14000	0.065	0.089	0.000	0.000	0.000	0.157	0.000	0.016	0.000	0.082	0.000	0.000	0.029	0.043
14500	0.069	0.091	0.000	0.000	0.000	0.185	0.000	0.028	0.000	0.083	0.000	0.000	0.030	0.047
15000	0.072	0.094	0.000	0.000	0.000	0.214	0.000	0.032	0.000	0.083	0.000	0.000	0.031	0.052
15500	0.075	0.096	0.000	0.000	0.000	0.257	0.000	0.036	0.000	0.083	0.008	0.000	0.033	0.056
16000	0.078	0.099	0.000	0.000	0.000	0.270	0.000	0.039	0.070	0.083	0.031	0.136	0.035	0.060
16500	0.081	0.101	0.000	0.000	0.000	0.283	0.000	0.043	0.071	0.084	0.054	0.157	0.037	0.064
17000	0.084	0.103	0.000	0.001	0.000	0.295	0.000	0.046	0.071	0.084	0.075	0.178	0.040	0.068
17500	0.087	0.106	0.000	0.006	0.000	0.307	0.000	0.049	0.071	0.084	0.096	0.197	0.042	0.072
18000	0.090	0.108	0.000	0.010	0.035	0.319	0.000	0.052	0.071	0.084	0.117	0.217	0.050	0.076
18500	0.093	0.110	0.000	0.015	0.035	0.330	0.000	0.055	0.072	0.085	0.137	0.236	0.058	0.079
19000	0.095	0.112	0.000	0.020	0.035	0.342	0.000	0.058	0.072	0.085	0.156	0.254	0.066	0.083
19500	0.098	0.114	0.000	0.024	0.035	0.352	0.000	0.061	0.072	0.085	0.175	0.272	0.073	0.086
20000	0.100	0.116	0.000	0.028	0.035	0.363	0.000	0.064	0.072	0.085	0.193	0.290	0.081	0.186
20500	0.103	0.118	0.000	0.033	0.035	0.373	0.038	0.067	0.072	0.085	0.211	0.307	0.088	0.200
21000	0.105	0.119	0.036	0.037	0.035	0.383	0.040	0.070	0.073	0.086	0.228	0.323	0.095	0.214
21500	0.108	0.121	0.036	0.041	0.035	0.393	0.043	0.072	0.073	0.086	0.245	0.339	0.102	0.227
22000	0.110	0.123	0.036	0.045	0.035	0.402	0.045	0.075	0.073	0.086	0.262	0.355	0.109	0.240
22500	0.112	0.125	0.036	0.049	0.143	0.412	0.047	0.077	0.073	0.086	0.278	0.371	0.115	0.253
23000	0.114	0.126	0.036	0.052	0.143	0.421	0.049	0.080	0.073	0.086	0.294	0.386	0.122	0.266
23500	0.116	0.128	0.036	0.056	0.143	0.430	0.052	0.082	0.074	0.087	0.310	0.401	0.128	0.278
24000	0.118	0.130	0.036	0.060	0.143	0.439	0.054	0.085	0.074	0.087	0.325	0.415	0.134	0.290
24500	0.121	0.131	0.036	0.063	0.143	0.447	0.056	0.087	0.074	0.087	0.340	0.429	0.140	0.302
25000	0.123	0.133	0.036	0.067	0.143	0.456	0.058	0.089	0.074	0.087	0.355	0.443	0.146	0.314
25500	0.124	0.134	0.036	0.070	0.143	0.464	0.060	0.091	0.074	0.087	0.369	0.457	0.152	0.325
26000	0.126	0.136	0.036	0.073	0.143	0.472	0.062	0.094	0.074	0.087	0.383	0.470	0.157	0.336
26500	0.128	0.137	0.036	0.077	0.143	0.480	0.064	0.096	0.074	0.087	0.397	0.483	0.163	0.347
27000	0.130	0.138	0.036	0.080	0.143	0.488	0.066	0.098	0.075	0.088	0.411	0.496	0.168	0.358
27500	0.132	0.140	0.036	0.083	0.143	0.495	0.068	0.100	0.075	0.088	0.424	0.509	0.174	0.369
28000	0.134	0.141	0.036	0.086	0.143	0.503	0.070	0.102	0.075	0.088	0.437	0.521	0.179	0.379
28500	0.136	0.143	0.036	0.089	0.143	0.510	0.072	0.104	0.075	0.088	0.450	0.534	0.184	0.389
29000	0.137	0.144	0.036	0.092	0.143	0.517	0.073	0.106	0.075	0.088	0.462	0.546	0.189	0.399
29500	0.139	0.145	0.036	0.095	0.143	0.525	0.075	0.108	0.075	0.088	0.475	0.557	0.194	0.409
30000	0.141	0.146	0.036	0.098	0.143	0.532	0.077	0.110	0.075	0.088	0.487	0.569	0.199	0.419
30500	0.142	0.148	0.036	0.101	0.143	0.538	0.079	0.111	0.076	0.089	0.499	0.580	0.204	0.428
31000	0.144	0.149	0.036	0.103	0.143	0.545	0.080	0.113	0.076	0.089	0.511	0.591	0.209	0.438
31500	0.145	0.150	0.036	0.106	0.143	0.552	0.082	0.115	0.076	0.089	0.522	0.602	0.213	0.447
32000	0.147	0.151	0.036	0.109	0.143	0.558	0.083	0.117	0.076	0.089	0.534	0.613	0.218	0.456
32500	0.149	0.153	0.036	0.112	0.143	0.565	0.085	0.119	0.076	0.089	0.545	0.624	0.223	0.465
33000	0.150	0.154	0.036	0.114	0.143	0.571	0.087	0.120	0.076	0.089	0.556	0.635	0.227	0.473
33500	0.152	0.155	0.036	0.117	0.143	0.577	0.088	0.122	0.076	0.089	0.567	0.645	0.231	0.482
34000	0.153	0.156	0.036	0.119	0.143	0.584	0.090	0.124	0.076	0.089	0.578	0.655	0.236	0.491
34500	0.154	0.157	0.036	0.122	0.143	0.590	0.091	0.125	0.077	0.090	0.588	0.665	0.240	0.499
35000	0.156	0.158	0.036	0.124	0.143	0.596	0.093	0.127	0.077	0.090	0.599	0.675	0.244	0.507

REPRESENTATIVE GROUP VIII
WETTED SURFACE AREA (SQ.FT./10^5)

Qms	125.6R	128.4R	132.5L	135.0R	135.1R	144.0M	145.6R	146.6L
5000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9500	0.013	0.012	0.000	0.000	0.000	0.000	0.000	0.000
10000	0.013	0.026	0.000	0.000	0.000	0.000	0.000	0.000
10500	0.013	0.040	0.000	0.000	0.000	0.000	0.000	0.000
11000	0.013	0.052	0.000	0.000	0.058	0.000	0.000	0.000
11500	0.013	0.065	0.000	0.000	0.058	0.000	0.000	0.000
12000	0.013	0.076	0.000	0.000	0.058	0.000	0.000	0.000
12500	0.013	0.088	0.000	0.000	0.058	0.000	0.000	0.000
13000	0.013	0.098	0.000	0.000	0.058	0.000	0.000	0.000
13500	0.013	0.109	0.000	0.000	0.058	0.000	0.000	0.000
14000	0.013	0.119	0.000	0.000	0.058	0.000	0.000	0.000
14500	0.013	0.129	0.000	0.000	0.058	0.000	0.000	0.000
15000	0.013	0.138	0.088	0.000	0.058	0.000	0.000	0.000
15500	0.013	0.147	0.093	0.000	0.058	0.000	0.000	0.000
16000	0.013	0.156	0.097	0.000	0.058	0.000	0.000	0.000
16500	0.023	0.164	0.101	0.000	0.058	0.000	0.000	0.005
17000	0.035	0.173	0.105	0.000	0.058	0.000	0.000	0.006
17500	0.047	0.181	0.109	0.000	0.058	0.000	0.174	0.006
18000	0.059	0.188	0.113	0.000	0.058	0.000	0.181	0.007
18500	0.070	0.196	0.116	0.000	0.058	0.000	0.188	0.007
19000	0.082	0.203	0.120	0.000	0.058	0.000	0.195	0.008
19500	0.092	0.210	0.124	0.000	0.058	0.000	0.201	0.008
20000	0.103	0.217	0.127	0.000	0.058	0.000	0.208	0.008
20500	0.113	0.224	0.130	0.000	0.097	0.000	0.214	0.009
21000	0.123	0.231	0.134	0.000	0.105	0.000	0.220	0.009
21500	0.133	0.237	0.137	0.000	0.112	0.000	0.226	0.010
22000	0.142	0.244	0.140	0.222	0.120	0.000	0.232	0.010
22500	0.152	0.250	0.143	0.235	0.127	0.100	0.237	0.010
23000	0.161	0.256	0.146	0.247	0.134	0.100	0.243	0.011
23500	0.170	0.262	0.149	0.259	0.140	0.100	0.248	0.011
24000	0.179	0.268	0.152	0.271	0.147	0.100	0.254	0.011
24500	0.187	0.273	0.154	0.282	0.153	0.100	0.259	0.012
25000	0.196	0.279	0.157	0.294	0.160	0.100	0.264	0.012
25500	0.204	0.284	0.160	0.305	0.166	0.100	0.269	0.012
26000	0.212	0.290	0.162	0.315	0.172	0.100	0.274	0.013
26500	0.220	0.295	0.165	0.326	0.178	0.100	0.279	0.013
27000	0.228	0.300	0.167	0.336	0.184	0.100	0.284	0.013
27500	0.235	0.305	0.170	0.347	0.190	0.100	0.288	0.014
28000	0.243	0.310	0.172	0.357	0.195	0.100	0.293	0.014
28500	0.250	0.315	0.175	0.367	0.201	0.100	0.297	0.014
29000	0.250	0.320	0.177	0.376	0.206	0.100	0.302	0.014
29500	0.250	0.325	0.179	0.386	0.212	0.100	0.306	0.015
30000	0.250	0.329	0.182	0.395	0.217	0.100	0.310	0.015
30500	0.250	0.334	0.184	0.404	0.222	0.100	0.314	0.015
31000	0.250	0.338	0.186	0.413	0.227	0.100	0.318	0.015
31500	0.250	0.343	0.188	0.422	0.232	0.100	0.323	0.016
32000	0.250	0.347	0.190	0.431	0.237	0.100	0.326	0.016
32500	0.250	0.351	0.193	0.440	0.242	0.100	0.330	0.016
33000	0.250	0.356	0.195	0.448	0.247	0.100	0.334	0.016
33500	0.250	0.360	0.197	0.457	0.252	0.100	0.338	0.017
34000	0.250	0.364	0.199	0.465	0.256	0.100	0.342	0.017
34500	0.250	0.368	0.201	0.473	0.261	0.100	0.346	0.017
35000	0.250	0.372	0.203	0.481	0.265	0.100	0.349	0.017

REPRESENTATIVE GROUP IX
WETTED SURFACE AREA (SQ.FT./10^5)

QMS	101.5L	104.0R	105.7R	108.9L	109.4R	111.0R	113.8R	117.7L	127.1M	128.3R	129.3L	129.8R	131.2R	135.0L
5000	1.084	0.643	0.358	0.321	0.913	0.861	0.134	0.152	0.360	0.642	0.160	0.566	0.123	0.212
5500	1.160	0.658	0.364	0.327	0.932	0.890	0.136	0.163	0.389	0.697	0.165	0.573	0.128	0.212
6000	1.230	0.672	0.368	0.332	0.949	0.917	0.139	0.172	0.416	0.747	0.170	0.580	0.133	0.212
6500	1.294	0.685	0.373	0.337	0.965	0.941	0.141	0.181	0.441	0.793	0.174	0.586	0.137	0.212
7000	1.353	0.697	0.377	0.341	0.980	0.964	0.144	0.189	0.464	0.836	0.178	0.591	0.141	0.212
7500	1.408	0.708	0.381	0.345	0.994	0.984	0.146	0.197	0.485	0.875	0.182	0.596	0.144	0.212
8000	1.460	0.718	0.384	0.349	1.006	1.004	0.148	0.204	0.505	0.913	0.185	0.601	0.147	0.212
8500	1.508	0.728	0.388	0.353	1.019	1.023	0.149	0.210	0.524	0.948	0.189	0.606	0.150	0.212
9000	1.554	0.737	0.391	0.356	1.030	1.040	0.151	0.216	0.541	0.980	0.192	0.610	0.153	0.212
9500	1.597	0.745	0.394	0.360	1.041	1.056	0.153	0.222	0.558	1.012	0.194	0.614	0.156	0.212
10000	1.638	0.754	0.397	0.363	1.051	1.072	0.154	0.228	0.574	1.041	0.197	0.618	0.159	0.212
10500	1.677	0.761	0.399	0.366	1.061	1.087	0.156	0.233	0.589	1.069	0.200	0.621	0.161	0.212
11000	1.715	0.769	0.402	0.368	1.070	1.101	0.157	0.238	0.603	1.096	0.202	0.625	0.164	0.212
11500	1.750	0.776	0.404	0.371	1.079	1.114	0.159	0.243	0.617	1.122	0.205	0.628	0.166	0.212
12000	1.784	0.783	0.407	0.374	1.087	1.127	0.160	0.248	0.630	1.146	0.207	0.631	0.168	0.212
12500	1.817	0.789	0.409	0.376	1.095	1.140	0.161	0.252	0.643	1.170	0.209	0.634	0.170	0.212
13000	1.848	0.796	0.411	0.378	1.103	1.152	0.162	0.257	0.655	1.192	0.211	0.637	0.172	0.212
13500	1.878	0.802	0.413	0.381	1.111	1.163	0.163	0.261	0.667	1.214	0.213	0.640	0.174	0.212
14000	1.907	0.807	0.415	0.383	1.118	1.174	0.164	0.265	0.678	1.235	0.215	0.642	0.176	0.212
14500	1.936	0.813	0.417	0.385	1.125	1.185	0.165	0.268	0.689	1.255	0.217	0.645	0.178	0.212
15000	1.963	0.819	0.419	0.387	1.132	1.195	0.166	0.272	0.699	1.275	0.219	0.648	0.179	0.212
15500	1.989	0.824	0.421	0.389	1.138	1.205	0.167	0.276	0.709	1.294	0.220	0.650	0.181	0.212
16000	2.014	0.829	0.422	0.391	1.144	1.215	0.168	0.279	0.719	1.312	0.222	0.652	0.183	0.212
16500	2.039	0.834	0.424	0.393	1.151	1.224	0.169	0.283	0.729	1.330	0.224	0.655	0.184	0.212
17000	2.063	0.839	0.426	0.394	1.156	1.233	0.170	0.286	0.738	1.347	0.225	0.657	0.186	0.212
17500	2.086	0.843	0.427	0.396	1.162	1.242	0.171	0.289	0.747	1.363	0.227	0.659	0.187	0.212
18000	2.109	0.848	0.429	0.398	1.168	1.251	0.172	0.292	0.756	1.380	0.228	0.661	0.189	0.212
18500	2.130	0.852	0.430	0.400	1.173	1.259	0.173	0.295	0.764	1.396	0.230	0.663	0.190	0.212
19000	2.152	0.856	0.432	0.401	1.179	1.267	0.174	0.298	0.772	1.411	0.231	0.665	0.191	0.212
19500	2.173	0.861	0.433	0.403	1.184	1.275	0.174	0.301	0.780	1.426	0.233	0.667	0.193	0.212
20000	2.193	0.865	0.435	0.404	1.189	1.283	0.175	0.303	0.788	1.440	0.234	0.669	0.194	0.212
20500	2.213	0.869	0.436	0.406	1.194	1.290	0.176	0.306	0.796	1.455	0.235	0.671	0.195	0.212
21000	2.232	0.872	0.437	0.407	1.199	1.297	0.177	0.309	0.803	1.469	0.236	0.672	0.197	0.212
21500	2.251	0.876	0.439	0.409	1.203	1.305	0.177	0.311	0.811	1.482	0.238	0.674	0.198	0.212
22000	2.269	0.880	0.440	0.410	1.208	1.312	0.178	0.314	0.818	1.495	0.239	0.676	0.199	0.212
22500	2.287	0.883	0.441	0.411	1.212	1.318	0.179	0.316	0.825	1.508	0.240	0.678	0.200	0.212
23000	2.305	0.887	0.442	0.413	1.217	1.325	0.179	0.319	0.831	1.521	0.241	0.679	0.201	0.212
23500	2.322	0.890	0.444	0.414	1.221	1.332	0.180	0.321	0.838	1.533	0.242	0.681	0.202	0.212
24000	2.339	0.894	0.445	0.415	1.225	1.338	0.181	0.323	0.845	1.545	0.244	0.682	0.203	0.212
24500	2.355	0.897	0.446	0.416	1.229	1.344	0.181	0.326	0.851	1.557	0.245	0.684	0.204	0.212
25000	2.371	0.900	0.447	0.418	1.233	1.350	0.182	0.328	0.857	1.569	0.246	0.685	0.205	0.212
25500	2.387	0.903	0.448	0.419	1.237	1.357	0.182	0.330	0.863	1.580	0.247	0.687	0.206	0.212
26000	2.403	0.907	0.449	0.420	1.241	1.362	0.183	0.332	0.869	1.592	0.248	0.688	0.207	0.212
26500	2.418	0.910	0.450	0.421	1.245	1.368	0.184	0.334	0.875	1.603	0.249	0.690	0.208	0.212
27000	2.433	0.913	0.451	0.422	1.249	1.374	0.184	0.336	0.881	1.613	0.250	0.691	0.209	0.212
27500	2.448	0.916	0.452	0.423	1.252	1.379	0.185	0.338	0.887	1.624	0.251	0.692	0.210	0.212
28000	2.462	0.918	0.453	0.424	1.256	1.385	0.185	0.340	0.892	1.634	0.252	0.694	0.211	0.212
28500	2.476	0.921	0.454	0.425	1.259	1.390	0.186	0.342	0.898	1.644	0.253	0.695	0.212	0.212
29000	2.490	0.924	0.455	0.427	1.263	1.396	0.186	0.344	0.903	1.654	0.254	0.696	0.213	0.212
29500	2.504	0.927	0.456	0.428	1.266	1.401	0.187	0.346	0.908	1.664	0.254	0.698	0.214	0.212
30000	2.517	0.929	0.457	0.429	1.269	1.406	0.187	0.348	0.913	1.674	0.255	0.699	0.215	0.212
30500	2.530	0.932	0.458	0.430	1.273	1.411	0.188	0.349	0.919	1.683	0.256	0.700	0.216	0.212
31000	2.543	0.935	0.459	0.431	1.276	1.416	0.188	0.351	0.924	1.693	0.257	0.701	0.216	0.212
31500	2.556	0.937	0.460	0.431	1.279	1.421	0.189	0.353	0.929	1.702	0.258	0.702	0.217	0.212
32000	2.569	0.940	0.461	0.432	1.282	1.426	0.189	0.355	0.933	1.711	0.259	0.704	0.218	0.212
32500	2.581	0.942	0.461	0.433	1.285	1.430	0.190	0.356	0.938	1.720	0.260	0.705	0.219	0.212
33000	2.593	0.945	0.462	0.434	1.288	1.435	0.190	0.358	0.943	1.729	0.260	0.706	0.220	0.212
33500	2.605	0.947	0.463	0.435	1.291	1.439	0.191	0.360	0.948	1.738	0.261	0.707	0.220	0.212
34000	2.617	0.949	0.464	0.436	1.294	1.444	0.191	0.361	0.952	1.746	0.262	0.708	0.221	0.212
34500	2.629	0.952	0.465	0.437	1.297	1.448	0.191	0.363	0.957	1.754	0.263	0.709	0.222	0.212
35000	2.640	0.954	0.465	0.438	1.300	1.453	0.192	0.364	0.961	1.763	0.264	0.710	0.223	0.212

REPRESENTATIVE GROUP IX
WETTED SURFACE AREA (SQ.FT./10^5)

Qms	139.2R	141.2R	141.3R	142.8R	144.2L	147.1L
5000	0.420	0.114	0.305	0.797	1.894	0.483
5500	0.434	0.120	0.305	0.826	1.894	0.492
6000	0.447	0.127	0.305	0.851	1.894	0.500
6500	0.458	0.132	0.305	0.875	1.894	0.508
7000	0.469	0.138	0.305	0.897	1.894	0.515
7500	0.480	0.143	0.305	0.918	1.894	0.522
8000	0.489	0.147	0.305	0.937	1.894	0.528
8500	0.498	0.151	0.305	0.955	1.894	0.534
9000	0.507	0.155	0.305	0.972	1.894	0.539
9500	0.515	0.159	0.305	0.988	1.894	0.544
10000	0.522	0.163	0.305	1.004	1.894	0.549
10500	0.529	0.166	0.305	1.018	1.894	0.554
11000	0.536	0.170	0.305	1.032	1.894	0.558
11500	0.543	0.173	0.305	1.045	1.894	0.563
12000	0.549	0.176	0.305	1.058	1.894	0.567
12500	0.555	0.179	0.305	1.070	1.894	0.571
13000	0.561	0.182	0.305	1.082	1.894	0.574
13500	0.567	0.184	0.305	1.093	1.894	0.578
14000	0.572	0.187	0.305	1.104	1.894	0.581
14500	0.577	0.189	0.305	1.114	1.894	0.585
15000	0.582	0.192	0.305	1.125	1.894	0.588
15500	0.587	0.194	0.305	1.134	1.894	0.591
16000	0.592	0.196	0.305	1.144	1.894	0.594
16500	0.596	0.198	0.305	1.153	1.894	0.597
17000	0.601	0.201	0.305	1.162	1.894	0.600
17500	0.605	0.203	0.305	1.170	1.894	0.603
18000	0.609	0.205	0.305	1.179	1.894	0.606
18500	0.613	0.207	0.305	1.187	1.894	0.608
19000	0.617	0.209	0.305	1.195	1.894	0.611
19500	0.621	0.210	0.305	1.203	1.894	0.613
20000	0.625	0.212	0.305	1.210	1.894	0.616
20500	0.628	0.214	0.305	1.218	1.894	0.618
21000	0.632	0.216	0.305	1.225	1.894	0.620
21500	0.635	0.217	0.305	1.232	1.894	0.623
22000	0.639	0.219	0.305	1.239	1.894	0.625
22500	0.642	0.221	0.305	1.245	1.894	0.627
23000	0.645	0.222	0.305	1.252	1.894	0.629
23500	0.649	0.224	0.305	1.258	1.894	0.631
24000	0.652	0.225	0.305	1.265	1.894	0.633
24500	0.655	0.227	0.305	1.271	1.894	0.635
25000	0.658	0.228	0.305	1.277	1.894	0.637
25500	0.661	0.229	0.305	1.283	1.894	0.639
26000	0.664	0.231	0.305	1.288	1.894	0.641
26500	0.666	0.232	0.305	1.294	1.894	0.643
27000	0.669	0.233	0.305	1.300	1.894	0.645
27500	0.672	0.235	0.305	1.305	1.894	0.646
28000	0.675	0.236	0.305	1.311	1.894	0.648
28500	0.677	0.237	0.305	1.316	1.894	0.650
29000	0.680	0.239	0.305	1.321	1.894	0.651
29500	0.682	0.240	0.305	1.326	1.894	0.653
30000	0.685	0.241	0.305	1.331	1.894	0.655
30500	0.687	0.242	0.305	1.336	1.894	0.656
31000	0.690	0.243	0.305	1.341	1.894	0.658
31500	0.692	0.244	0.305	1.346	1.894	0.659
32000	0.694	0.246	0.305	1.350	1.894	0.661
32500	0.697	0.247	0.305	1.355	1.894	0.662
33000	0.699	0.248	0.305	1.359	1.894	0.664
33500	0.701	0.249	0.305	1.364	1.894	0.665
34000	0.703	0.250	0.305	1.368	1.894	0.667
34500	0.705	0.251	0.305	1.373	1.894	0.668
35000	0.708	0.252	0.305	1.377	1.894	0.669

APPENDIX D

WEIGHTED USABLE AREA (WUA) VALUES FOR SPECIFIC AREAS

REPRESENTATIVE GROUP 1
WEIGHTED USABLE AREA (SQ. FT.)

Qms	102.2L	105.2R	107.6L	108.3L	112.5L	119.4L	120.0R	121.9R	123.1R	123.3R	127.2M	129.4R	133.9L	134.0L
5000	2341	0	1900	987	3957	0	5393	492	46	1027	145	11519	1931	764
5500	2341	88	1899	987	4049	0	5736	492	300	1027	158	11511	1931	764
6000	2341	173	1896	987	4132	0	6044	492	532	1027	171	11494	1931	764
6500	2341	251	1892	987	4209	0	6320	492	744	1027	182	11467	1931	764
7000	2341	323	1886	987	4280	0	6569	492	938	1027	193	11432	1931	764
7500	2341	390	1878	987	4346	0	6792	492	1116	1027	202	11388	1931	764
8000	2341	453	1870	987	4408	0	6992	492	1281	1027	212	11334	1931	764
8500	2341	512	1859	987	4466	0	7169	492	1432	1027	220	11272	1931	764
9000	2341	568	1848	987	4521	0	7327	492	1572	1027	228	11201	1931	764
9500	2341	620	1835	987	4573	0	7465	492	1700	1027	236	11122	1931	764
10000	2341	670	1820	987	4622	0	7585	492	1818	1027	243	11034	1931	764
10500	2341	718	1804	987	4669	0	7688	492	1926	1027	250	10938	1931	764
11000	2341	763	1787	987	4713	1638	7774	492	2025	1027	257	10834	1931	764
11500	2341	806	1769	987	4756	1741	7845	492	2114	1027	263	10722	1931	764
12000	2341	848	1749	987	4797	1836	7900	492	2195	1027	269	10602	1931	764
12500	2341	887	1728	987	4836	1922	7940	492	2268	1027	1068	10475	1931	764
13000	2341	925	1706	1030	4874	2000	7966	492	2333	1027	1078	10340	1931	764
13500	2341	962	2140	1030	4910	2070	7979	492	2390	1027	1087	10199	1931	764
14000	2341	998	2599	1030	4945	2132	7978	492	2440	1027	1096	10050	1931	764
14500	2341	1032	3025	1030	4978	2188	7966	492	2483	1027	1105	9896	1931	764
15000	2341	1065	3418	1030	5011	2236	7942	492	2520	1027	1114	9736	1931	764
15500	2341	1097	3781	1030	5042	2277	7907	492	2550	1027	1122	9572	1931	764
16000	2341	1128	4114	1030	5073	2313	7861	492	2574	1027	1130	9402	1931	764
16500	2341	1158	4418	1030	5102	2342	7805	492	2592	1222	1137	9228	1931	925
17000	2341	1187	4695	1030	5131	2365	7739	492	2605	1269	1145	9049	1931	948
17500	2341	1215	4944	1030	5159	2382	7664	492	2612	1316	1152	8866	1916	970
18000	2341	1242	5168	1030	5186	2394	7580	492	2614	1361	1159	8680	1938	992
18500	2341	1269	5367	1030	5212	2400	7488	492	2610	1405	1166	8489	1959	1013
19000	2341	1295	5541	1030	5238	2401	7387	492	2602	1448	1173	8296	1980	1033
19500	2341	1320	5690	1030	5262	2397	7277	492	2589	1489	1179	8098	2000	1053
20000	2341	1345	5812	1030	5287	2386	7153	492	2569	1530	1185	7890	2020	1072
20500	2341	1369	5906	1030	5310	2369	7017	492	2542	1569	1191	7673	2039	1091
21000	2341	1392	5974	1030	5334	2345	6869	492	2509	1608	1197	7449	2058	1110
21500	2341	1415	6014	1030	5356	2314	6707	492	2470	1646	1203	7215	2077	1128
22000	2341	1437	6038	1030	5378	2281	6544	492	2429	1683	1209	6986	2094	1145
22500	2341	1459	6098	1030	5400	2265	6435	492	2406	1685	1215	6818	2112	1162
23000	2341	1481	6110	1030	5421	2234	6848	492	2367	1685	1220	6613	2129	1179
23500	2341	1502	6158	1030	5441	2218	6972	492	2346	1685	1225	6463	2146	1196
24000	2341	1522	6230	1030	5462	2214	7118	492	2336	1685	1231	6351	2162	1212
24500	2341	1542	6082	1030	5481	2133	7007	492	2247	1685	1236	6030	2179	1201
25000	2341	1562	5915	1030	5501	2050	6868	492	2155	1685	1241	5711	2194	1201
25500	2341	1581	5727	1030	5520	1962	6698	492	2059	1685	1246	5392	2210	1201
26000	2341	1600	5700	1030	5538	1932	6711	492	2024	1685	1251	5238	2225	1201
26500	2341	1619	5881	1030	5557	1973	6966	492	2064	1685	1255	5280	2240	1201
27000	2341	1637	6051	1030	5575	2010	7209	492	2100	1685	1260	5313	2254	1201
27500	2341	1655	6274	1030	5592	2066	7515	492	2154	1685	1265	5393	2269	1201
28000	2341	1672	6488	1030	5609	2117	7680	492	2205	1685	1269	5463	2283	1201
28500	2341	1689	6711	1030	5626	2172	7789	492	2259	1685	1273	5540	2297	1201
29000	2341	1706	6876	1030	5643	2208	7830	492	2293	1685	1278	5569	2310	1201
29500	2341	1723	7050	1030	5659	2247	7881	492	2331	1685	1282	5606	2323	1201
30000	2341	1739	7156	1030	5676	2264	7859	492	2346	1685	1286	5591	2337	1201
30500	2341	1755	7328	1030	5691	2303	7912	492	2383	1685	1290	5628	2350	1201
31000	2341	1771	7450	1030	5707	2326	7911	492	2404	1685	1294	5627	2362	1201
31500	2341	1787	7573	1030	5722	2349	7913	492	2426	1685	1298	5629	2375	1201
32000	2341	1802	7680	1030	5738	2368	7901	492	2442	1685	1302	5620	2387	1201
32500	2341	1817	7797	1030	5752	2390	7901	492	2463	1685	1306	5620	2399	1201
33000	2341	1832	7903	1030	5767	2409	7892	492	2480	1685	1310	5614	2411	1201
33500	2341	1847	8025	1030	5781	2433	7901	492	2502	1685	1314	5620	2423	1201
34000	2341	1861	8132	1030	5796	2453	7896	492	2520	1685	1317	5617	2434	1201
34500	2341	1875	8201	1030	5810	2461	7857	492	2526	1685	1321	5589	2446	1201
35000	2341	1889	8270	1030	5823	2470	7820	492	2533	1685	1325	5563	2457	1201

REPRESENTATIVE GROUP 1
WEIGHTED USABLE AREA (SQ. FT.)

Qms	135.5R	135.6R	136.9R	139.0L	139.9R
5000	3541	21112	178	2504	545
5500	3538	21389	226	2919	545
6000	3533	21622	271	3294	545
6500	3525	21817	311	3635	545
7000	3514	21975	349	3945	545
7500	3501	22098	384	4228	545
8000	3484	22189	417	4486	545
8500	3465	22249	447	4721	545
9000	3443	22280	476	4934	545
9500	3419	22282	504	5128	545
10000	3392	22256	530	5302	545
10500	3362	22204	555	5458	545
11000	3330	22127	578	5598	545
11500	3296	22024	601	5721	545
12000	3259	21898	623	5828	545
12500	3220	21749	643	5920	545
13000	3179	21577	1126	5998	545
13500	3135	21384	1324	6062	545
14000	3089	21170	1515	6113	545
14500	3042	20937	1699	6151	545
15000	2993	20687	1877	6177	545
15500	2942	20421	2049	6191	545
16000	2890	20138	2216	6195	545
16500	2837	19840	2377	6188	545
17000	2782	19528	2534	6171	545
17500	2726	19202	2686	6144	545
18000	2668	18862	2834	6107	545
18500	2610	18511	2977	6062	545
19000	2550	18148	3117	6007	545
19500	2489	17770	3254	5944	545
20000	2425	17367	3386	5867	545
20500	2359	16940	3516	5778	545
21000	2290	16493	3642	5677	527
21500	2218	16021	3766	5563	536
22000	2147	15553	3887	5447	544
22500	2096	15220	4004	5374	552
23000	2033	14801	4120	5268	560
23500	1987	14504	4233	5202	568
24000	1952	14288	4343	5162	576
24500	1854	13598	4451	4948	583
25000	1756	12910	4557	4731	591
25500	1657	12216	4661	4507	598
26000	1610	11895	4763	4417	605
26500	1623	12017	4863	4490	612
27000	1633	12119	4961	4556	618
27500	1658	12327	5057	4662	625
28000	1679	12514	5152	4760	632
28500	1703	12717	5245	4865	638
29000	1712	12809	5336	4927	644
29500	1723	12919	5426	4996	651
30000	1719	12908	5514	5018	657
30500	1730	13019	5601	5086	663
31000	1730	13041	5686	5120	669
31500	1730	13069	5770	5156	674
32000	1728	13073	5852	5182	680
32500	1728	13096	5934	5215	686
33000	1726	13104	6014	5242	691
33500	1728	13141	6093	5280	697
34000	1727	13155	6171	5308	702
34500	1718	13112	6247	5312	707
35000	1710	13072	6323	5318	713

REPRESENTATIVE GROUP II
WEIGHTED USABLE AREA (SQUARE FEET)

Qms	100.6R	101.4L	101.8L	113.1R	113.7R	115.6R	117.9L	118.0L	121.8R	122.4R	122.5R	123.6R	125.1R	125.9R	
5000	1461	20335	1158	0	5273	18883	0	1005	1854	0	24090	3462	0	6778	5000
5500	1461	20713	1189	0	5273	19231	0	1009	1868	0	24657	3596	0	6869	5500
6000	1461	21090	1219	0	5273	19580	0	1018	1891	0	25224	3730	0	6959	6000
6500	1461	21468	1250	0	5273	19928	0	1031	1923	0	25847	3864	0	7049	6500
7000	1461	21846	1280	0	5299	20277	0	1045	1960	0	26471	3985	0	7140	7000
7500	1461	22223	1310	0	5339	20626	0	1064	2006	0	27151	4105	1549	7230	7500
8000	1461	22393	1316	0	5404	21400	269	1083	2053	0	27831	4220	4909	7280	8000
8500	1461	22562	1321	0	5497	22175	538	1103	2103	0	28568	4356	10002	7331	8500
9000	1461	22732	1325	0	5602	22950	806	1123	2154	0	29418	4504	15324	7381	9000
9500	1461	22901	1330	0	5734	23724	1073	1144	2209	0	30382	4675	20867	7431	9500
10000	1461	23071	1334	0	5866	24499	1339	1165	2265	0	31459	4869	18332	7481	10000
10500	1461	23240	1338	0	6011	25274	1604	1186	2325	0	32706	5068	19303	7531	10500
11000	1461	23603	1364	0	6156	25310	1692	1515	2394	0	34010	5309	20749	7720	11000
11500	1461	23966	1389	0	6314	25346	1779	1856	2472	0	35313	5552	21988	7908	11500
12000	1461	24329	1414	258	6472	25382	1864	2220	2560	0	36674	5807	23623	8096	12000
12500	1461	24693	1438	263	6643	25419	1949	2614	2661	0	38091	6065	26937	8285	12500
13000	1461	24900	1444	268	6841	25523	1953	2697	2768	0	39564	6469	33142	8435	13000
13500	1461	25108	1450	637	7065	25626	1957	2770	2874	0	41095	6878	43187	8586	13500
14000	1461	25315	1455	648	7316	25730	1960	2986	2984	0	42739	7307	50990	8737	14000
14500	1461	25523	1460	1319	7606	25834	1962	3064	3100	0	44496	7768	53086	8887	14500
15000	1461	25730	1464	1358	7909	25938	1964	3142	3220	0	46423	8245	55386	9038	15000
15500	1461	25937	1468	1403	8212	26041	1965	3356	3344	0	48520	8771	57888	9188	15500
16000	1461	26145	1472	1452	8528	26145	1966	3432	3478	0	50788	9367	60593	9339	16000
16500	1461	27125	1483	1510	8858	26871	2375	3830	3621	0	53225	9851	63501	9640	16500
17000	1443	28106	1493	1570	9201	27598	2779	4252	3778	0	55832	10307	66611	9942	17000
17500	1443	29086	1503	1630	9557	28324	3178	4700	3948	0	58610	10777	69925	10243	17500
18000	1443	30067	1512	1693	9939	29050	3571	5152	4133	0	61557	11261	73442	10544	18000
18500	1443	30256	1521	1758	10347	29631	3724	9715	4331	651	64788	12338	77296	10921	18500
19000	1443	30444	1529	1827	10796	30212	3873	10191	4543	1335	68189	13390	81354	11297	19000
19500	1443	30633	1581	1897	11283	30793	4019	10698	4769	2042	71817	14517	85682	11674	19500
20000	1443	30822	1584	1973	11811	31374	4170	11236	5009	2784	75671	15693	90281	12050	20000
20500	1443	31011	1597	2054	12377	31955	4345	11826	5272	3560	79752	16948	95150	12427	20500
21000	1443	31200	1623	2143	12984	32536	4555	12447	5549	4377	84117	18284	100357	12804	21000
21500	1443	31389	1727	2240	13630	33117	4990	13109	5844	5242	88821	19615	105970	13180	21500
22000	1443	31953	2072	2345	14315	33698	6156	13813	6158	6129	94036	21009	112191	13557	22000
22500	1443	32539	2677	2457	15066	34279	8160	14557	6490	7058	99875	22437	119157	13933	22500
23000	1443	35060	4619	2578	15857	34860	14427	15354	6845	8020	106563	23948	127137	14310	23000
23500	1443	39872	7425	2706	16701	35500	23345	16213	7228	8558	114272	25153	136334	14343	23500
24000	1443	47663	9340	2842	17597	38250	29363	17165	7652	8988	124135	26473	148101	14377	24000
24500	1443	57288	11483	2991	18546	43500	36104	18230	8127	9460	135755	27863	161964	14410	24500
25000	1443	69620	12951	3148	19561	52000	40719	19451	8672	9956	149642	29345	178532	14444	25000
25500	1443	81348	14203	3315	20655	62500	44655	20858	9299	10486	162112	30920	193410	14478	25500
26000	1443	88910	15239	3493	21868	75955	47912	22659	10101	11049	172882	32587	206259	14512	26000
26500	1443	93035	16016	3682	23226	88750	50355	24780	11047	11645	180250	34371	215050	14757	26500
27000	1443	95785	16793	3883	24781	97000	52798	27315	12177	12282	187052	36293	223165	15879	27000
27500	1443	96981	17017	4100	26574	101500	53501	29591	13192	12969	190170	38424	226885	17864	27500
28000	1443	96472	16750	4341	28867	104500	52663	31557	14068	13731	190737	40810	227561	21355	28000
28500	1443	95097	15973	4611	31570	105805	50219	32902	14668	14583	189320	43543	225870	25667	28500
29000	1443	92118	14894	4920	34799	105250	46826	34143	15221	15560	185919	46693	221813	31192	29000
29500	1443	87994	13426	5275	37699	103750	42212	34712	15475	16685	182518	50723	217755	36447	29500
30000	1443	83869	11872	5731	40204	100500	37325	34816	15521	18125	179117	55471	213698	39835	30000
30500	1443	79853	10534	6267	41917	96000	33118	34557	15406	19822	175716	61145	209640	41683	30500
31000	1446	76345	9235	6908	43499	91500	29035	33936	15129	21850	172315	66240	205583	42915	31000
31500	1458	73291	8202	7484	44224	87118	25788	33316	14852	23670	167793	70641	202899	43451	31500
32000	1481	70644	7253	7981	44356	83291	22802	32695	14576	25243	163210	73652	196935	43223	32000
32500	1576	68365	6389	8321	44026	79959	20088	32074	14299	26319	158855	76431	191271	42607	32500
33000	1891	66422	5612	8635	43235	77072	17645	31453	14022	27312	154337	77705	185436	41272	33000
33500	2443	64788	4965	8779	42444	74586	15609	30773	13696	27767	149838	77937	179948	39424	33500
34000	4216	63440	4447	8805	41654	72466	13980	29869	13293	27850	145137	77358	174302	37576	34000
34500	6777	62361	4015	8740	40863	70683	12623	29269	12911	27643	141045	75968	169029	35777	34500
35000	8524	61535	3626	8583	40072	69212	11401	28376	12517	27147	136755	74578	163888	34205	35000

REPRESENTATIVE GROUP II
WEIGHTED USABLE AREA (SQUARE FEET)

Qms	126.0R	126.3R	131.8L	133.9R	135.3L	137.5L	137.5R	137.8L	137.9L	140.2R	142.1R	142.2R	143.4L	144.4L
	87847	2802	0	15264	0	2282	3982	1888	0	7531	0	0	0	5282
	89223	2830	0	15264	0	2282	4011	2092	0	7895	0	0	0	5282
	90599	2858	0	15264	0	2282	4061	2295	0	8259	0	0	0	5282
	91975	2886	0	15264	0	2282	4130	2498	0	3622	0	0	0	5282
	93351	2914	0	15264	0	2282	4209	2702	0	8986	0	ERR	0	5282
	94727	2942	0	15264	0	2282	4308	2905	0	9349	0	0	0	5282
	95109	3129	273	15264	0	2282	4407	3365	0	9577	0	ERR	247	5282
	95491	3316	544	15264	0	2282	4516	3825	0	9304	0	ERR	493	5282
	95873	3503	813	15264	0	2282	4625	4285	0	10029	0	0	740	5282
	96256	3689	1080	15264	0	2282	4744	4745	0	10303	0	ERR	986	5282
	96638	3874	1352	15264	0	2282	4863	5205	0	10603	0	645	1233	5282
	97020	4058	1629	15264	0	2282	4992	5665	0	10958	0	643	1479	5282
	100063	4089	1706	15264	0	2282	5140	5883	1789	11499	427	642	2219	5282
	103106	4120	1735	15264	0	2282	5309	6101	3519	12054	783	640	2959	5282
	106149	4150	1768	15264	0	2282	5497	6318	5360	12687	1494	639	3698	5282
	109192	4179	1810	15264	0	2282	5715	6536	7280	13327	2204	637	4438	5282
	110830	4986	1851	15264	209	2275	5943	6827	8291	14344	2272	636	4903	5282
	112468	5790	1897	15264	431	2275	6170	7117	8620	15380	2341	634	5368	5282
	114106	6588	1943	15264	667	2275	6408	7408	9001	16468	2408	633	5833	5282
	115744	7382	1993	15264	913	2275	6656	7698	9336	17368	2475	631	6298	5282
	117382	8169	2043	15264	1172	2275	6913	7989	9717	17828	2541	629	6763	5282
	119020	8950	2097	15264	1443	2275	7181	8279	10119	18358	2605	628	7228	5282
	120658	9724	2159	15264	1726	2275	7468	8570	10560	18960	2670	626	7693	5282
	121363	9827	2230	15264	2464	2275	7775	8642	11089	19632	2733	624	8359	5282
	122069	9926	2309	15264	3240	2275	8112	8715	11615	20410	2794	622	9024	5282
	122774	10022	2400	15264	4051	2275	8478	8788	12195	21224	2855	621	9690	5282
	123480	10114	2496	15264	4906	2275	8874	8860	12829	22037	2915	619	10356	5282
	124944	10639	2592	15264	4532	2275	9300	9107	13518	22886	2973	617	12264	5282
	126408	11156	2692	15264	5284	2275	9756	9354	14245	23770	3030	617	14173	5294
	127872	11665	2796	15264	6085	2275	10241	9601	15006	24690	3086	621	16081	5337
	129336	12164	2904	15264	6914	2275	10756	9848	15838	25645	3140	629	17989	5424
	130801	12655	3016	15264	8326	2275	11321	10242	16720	26671	3193	667	19898	5770
	132265	13137	3137	15264	9495	2275	11915	11263	17785	27767	3244	798	21806	6924
	133729	13608	3266	15264	9993	2275	12549	12436	13698	28970	3294	1028	23715	8944
	135193	14070	3407	15264	10517	2275	13222	13854	19611	30279	3343	1768	25623	15435
	136657	14521	3561	15264	11077	2275	13935	16165	20605	31694	3390	2831	27532	24811
	138121	14994	3728	15264	11671	2275	14698	19789	21751	33215	3864	3546	29440	31207
	138444	15043	3907	15264	12301	2275	15520	23133	23040	34842	3829	4341	29470	38371
	138767	15208	4098	15264	12974	2275	16431	25296	24522	36575	3829	4871	29470	43275
	138564	16217	4302	15264	13700	2275	17451	26482	26213	38415	3837	5312	29470	47453
	138564	19461	4518	15264	14504	2275	18620	27278	28381	40431	3868	5665	29470	50920
	138564	25137	4755	15264	15405	2275	19967	27632	30958	42553	3931	5927	29470	53517
	138564	43381	5005	15264	16436	2275	21690	27491	33974	44817	4182	6180	29470	56113
	138564	69734	5271	15264	17625	2275	23721	27092	36747	47222	5018	6222	29470	56860
	138564	87710	5554	15264	19146	2280	26147	26226	39129	49769	6482	6090	29470	55969
	138564	107844	5854	15264	20939	2298	28326	25026	40764	52493	11187	5770	29470	53373
	138564	121629	6174	15264	23081	2336	30208	23820	42296	55429	17983	5352	29470	49766
	138564	133386	6519	15264	25004	2485	31496	22638	42913	58683	22618	4782	29470	44862
	138564	143116	6902	15264	26665	2982	32684	21596	42956	62326	27810	4180	29470	39669
	138564	150414	7330	18128	27802	3851	33229	20679	42581	66500	31365	3656	29470	35197
	138564	157712	7821	20992	28851	6647	33328	19873	41789	71311	34397	3181	29470	30858
	138564	159812	8387	20861	29332	10684	33080	19168	41023	77466	36906	2798	30011	27408
	138564	157306	9111	20467	29419	13439	32486	18553	40232	84717	38788	2449	32335	24234
	138564	150008	9964	20386	29200	16523	31892	18022	39419	93384	40670	2134	36771	21349
	138564	139873	10983	20303	28676	18636	31298	17568	38387	101165	41212	1849	43959	18753
	164564	126088	11898	20231	28151	20437	30703	17184	37691	107886	40565	1620	52836	16589
	190565	111493	12689	20259	27627	21928	30109	16867	36583	112485	38684	1443	64210	14858
	189376	98925	13230	20089	27102	23046	29448	16596	35531	116729	36070	1301	75027	13415
	185800	86729	13729	20155	26578	24164	28583	16360	34447	118675	32515	1179	82001	12117
	183811	77031	13958	20031	25996	24486	27761	16168	33684	119029	28751	1090	85805	11107
	182663	68112	13999	19934	25232	24102	26914	15943	32627	118144	25510	994	88341	10098

REPRESENTATIVE GROUP III

WEIGHTED USABLE AREA (SQUARE FEET)

Qms	100.4R	100.6L	101.2R	101.6L	101.7L	110.4L	115.0R	119.3L	128.5R	128.7R	128.8R	130.2R	130.2L	132.6L
5000	0	994	0	0	6180	0	0	0	0	0	5150	86400	0	0
5500	0	1026	0	0	6180	0	0	0	0	0	5150	87696	0	0
6000	0	1058	0	0	6180	0	0	0	0	0	5150	88992	536	0
6500	0	1090	0	0	6180	0	0	0	2594	0	5150	90288	1099	630
7000	0	1122	3343	0	6180	0	0	0	5203	0	5150	91584	1690	1430
7500	0	1154	7853	0	6180	0	0	0	7827	0	5150	92880	2307	2403
8000	0	1257	13490	0	6695	0	0	0	12054	0	5202	93924	4383	4942
8500	0	1360	20266	0	7210	0	0	0	17089	0	5253	94968	11242	8350
9000	0	1463	28184	0	8634	0	0	0	22934	0	5305	96012	14621	12628
9500	0	2265	59324	0	9134	0	0	0	29587	0	5356	97056	18471	17774
10000	0	3556	67133	0	13900	7052	10831	0	37049	0	5408	96823	21393	20264
10500	3325	5681	76426	0	21438	15458	23202	0	58440	0	5459	96606	22645	29851
11000	6676	9098	78998	0	33640	25119	43247	0	83741	2994	5567	100826	21016	52552
11500	10049	14895	76086	0	53796	36068	68919	0	88898	6277	5675	104975	20028	52095
12000	13443	25466	71128	2802	87820	48307	100226	0	93742	9848	5783	109058	17990	51606
12500	16857	27050	68247	5700	149535	98499	218494	0	98924	13708	5892	113050	17378	51425
13000	32527	29712	60912	8849	158038	105842	228438	0	116154	18878	6789	106284	16628	54384
13500	33712	30945	58485	12196	167612	115086	241962	0	132382	24745	7687	105954	16549	57057
14000	37776	31437	51707	15743	168891	117948	241829	2542	147868	31309	8584	110412	16486	59581
14500	40981	31736	47972	31046	166298	112706	225581	5175	163171	38570	9482	116058	15268	62168
15000	41074	32178	44875	33163	162967	104588	204546	7899	177856	59997	10379	114008	15764	64630
15500	39688	32069	39265	35860	160632	99664	190628	10712	185933	83938	11277	132572	16212	64877
16000	39147	31375	38500	36561	155819	89516	167593	13617	192316	87287	12175	130300	16617	64782
16500	36217	28577	41048	36911	148558	86344	175181	26787	186586	87230	18424	134155	16064	64342
17000	35887	25056	43382	35971	136993	76670	166934	28547	180835	87662	28337	135073	15541	63798
17500	32621	22872	45520	35817	121508	71428	165578	30801	170136	88032	44442	134853	15045	61373
18000	31017	20985	47479	33472	112110	67081	164474	31338	159399	88100	71159	135498	14576	58760
18500	29653	18613	46173	31680	103898	58085	142126	29438	146881	87491	121422	138862	14130	55960
19000	26453	17008	44933	27621	92896	56380	137677	26877	134308	87134	215395	130044	13707	52822
19500	26389	15130	43751	25282	85519	54770	133482	25216	126828	86738	236498	124574	13304	51433
20000	26289	12988	42625	23342	76600	53248	129522	22314	119314	83610	259953	130279	12919	49842
20500	26160	11135	41550	20165	66176	51806	125775	21250	113985	80374	270902	142321	12553	51150
21000	26005	9652	40522	19530	57329	50438	122224	18639	118653	78827	275362	137353	12203	52442
21500	25827	9742	39538	18930	49742	49137	118854	17161	110446	77216	278114	140818	11868	50145
22000	25631	9720	38596	18364	50458	47899	115651	15935	102204	73415	282115	140616	11548	47629
22500	25419	9568	37693	17829	50581	46719	112601	13844	98732	68885	281267	133218	11241	47191
23000	25193	10243	36825	17322	50005	45592	109694	13481	95246	63508	266476	135511	10947	42818
23500	24955	11307	36127	17232	51770	46892	106663	13477	105384	58094	243463	127031	11498	43756
24000	24708	11701	35555	16862	57073	45994	104781	13131	107715	55345	219645	125078	11326	44684
24500	24452	11279	34989	16503	58991	45116	102933	12799	105754	52511	205911	132764	11156	43833
25000	24189	12111	34430	16155	56797	44260	101120	12481	103624	52796	193707	128630	10987	42916
25500	23921	14167	33879	15817	60920	43423	99340	12176	101437	53065	175655	127983	10820	41978
26000	23648	14533	33334	15489	71190	42605	97595	11882	99095	49771	163876	119919	10655	40979
26500	23372	14191	32798	15171	72954	41807	95883	11599	100273	46396	148649	112227	10491	41437
27000	23092	14351	32269	14862	71168	41026	94204	11327	101414	45138	129968	114715	10329	41881
27500	22811	14304	31748	14561	71903	40264	92558	11065	103533	43842	113880	112240	10169	42729
28000	22528	14289	31234	14269	71606	39519	90943	10811	105645	44391	99885	114832	10012	43575
28500	22245	14375	30729	13984	71469	38791	89361	10567	104911	44935	102374	110365	9856	43247
29000	21961	14482	30232	13708	71838	38079	87809	10330	104098	43712	103639	116832	9702	42888
29500	21678	14381	29742	13438	72315	37384	86288	10102	101840	42457	103430	116157	9551	41936
30000	21394	14797	29260	13176	71758	36703	84796	9881	99473	41214	108051	115807	9402	40940
30500	21112	14462	28786	12920	73779	36038	83334	9667	108258	39942	120154	115593	9255	44534
31000	20831	12337	28320	12671	72059	35388	81900	9459	96604	40109	125228	113854	9110	39721
31500	20552	11294	27862	12429	61427	34752	80495	9258	96032	40269	121539	117303	8967	39468
32000	20274	11570	27411	12192	56197	34129	79117	9063	95449	40823	131365	119924	8826	39211
32500	19998	11146	26968	11961	57532	33520	77766	8874	94872	41377	154650	119743	8688	38958
33000	19724	10051	26532	11736	55388	32924	76441	8690	94284	40825	159617	117980	8551	38701
33500	19452	9467	26103	11516	49918	32341	75142	8512	93705	40257	156784	122977	8417	38448
34000	19183	9525	25682	11302	46993	31770	73868	8338	93115	39150	159457	122456	8285	38192
34500	18916	9588	25268	11092	47254	31212	72619	8170	92535	38021	159821	123008	8150	37940
35000	18651	9506	24861	10888	47537	30665	71394	8006	91946	41150	160509	126031	8020	47058

REPRESENTATIVE GROUP III
WEIGHTED USABLE AREA (SQUARE FEET)

Qms	133.7R	137.2R	141.4R
5000	3547	0	49518
5500	3586	0	51521
6000	3626	0	53525
6500	3665	2228	55528
7000	3704	4500	57532
7500	3744	6817	59535
8000	3711	10393	58842
8500	3678	14621	58149
9000	3645	19500	57456
9500	3612	25032	56024
10000	3580	31216	54635
10500	3547	49066	53297
11000	3596	89329	67870
11500	3645	94214	73494
12000	5345	96847	78723
12500	7978	106846	73179
13000	12086	106335	72061
13500	19772	105492	74128
14000	32935	104599	76886
14500	57101	104014	74506
15000	61336	103387	85454
15500	66016	99514	82838
16000	67419	95526	83432
16500	67206	95130	82249
17000	66610	94565	80466
17500	66347	91189	79286
18000	64988	87507	81298
18500	62524	82044	76114
19000	58146	76305	72841
19500	51985	73262	76055
20000	48323	70052	82908
20500	45099	70982	79805
21000	40591	71899	81572
21500	37603	67959	81180
22000	33882	63840	76625
22500	29437	62588	78493
23000	25639	61258	74395
23500	22360	66540	73144
24000	22793	64018	77530
24500	22955	62904	75016
25000	22795	61728	74544
25500	23700	60550	69762
26000	26235	59308	65212
26500	27224	60204	66585
27000	26311	61113	65079
27500	28324	62648	66514
28000	33215	64220	63865
28500	34153	64094	67544
29000	33426	63942	67093
29500	33877	62918	66833
30000	33840	61835	66654
30500	33875	67734	65598
31000	34147	60855	67533
31500	34469	60928	68990
32000	34295	61008	68836
32500	35352	61108	67775
33000	34615	61216	70597
33500	29579	61342	70252
34000	27125	61475	70523
34500	27834	61626	72212
35000	26857	61783	72200

REPRESENTATIVE GROUP IV
WEIGHTED USABLE AREA (SQUARE FEET)

Qms	100.7R	108.7L	110.8M	111.5R	112.6L	114.0R	116.8R	119.5L	119.6L	121.7R	124.1L	125.2R	127.0L	127.4L
5000	195822	42286	48819	209782	539787	344781	102214	79555	301584	332037	176350	251532	73238	324594
5500	211894	40398	51214	228994	496741	378596	107346	77963	283416	364566	191179	237899	69061	341867
6000	226904	38302	53384	247018	460715	410405	112005	75540	264812	395164	205044	229276	65397	357614
6500	240474	35936	55250	263432	420847	439490	116023	72220	245223	423140	217599	223671	60822	371291
7000	253499	33409	57024	279206	421242	467463	119847	68260	225297	450045	229655	192141	61847	384325
7500	268415	31126	59244	297039	384030	498856	124604	64533	207648	480244	243413	175244	57177	400339
8000	283006	28727	61399	314504	354758	529620	129225	60345	189756	509837	256886	208495	53483	415911
8500	287508	26998	61405	320707	315242	541367	129320	57388	176716	521125	261186	193107	48064	416836
9000	291619	25194	61393	326393	283097	552153	129371	54132	163518	531489	265117	170040	43607	417677
9500	282063	23466	58598	316667	245874	536741	123551	50918	151112	516637	256603	147319	38229	399442
10000	272706	21679	55962	307017	218783	521303	118053	47467	138581	501763	248243	133104	34310	382167
10500	257650	19551	52271	290811	210386	494582	110321	43165	124116	476031	234671	141073	33256	357574
11000	244086	17366	48993	276152	150734	470345	103450	38639	109533	452692	222433	132211	24002	335692
11500	244649	19964	48617	277394	121870	473104	102700	44739	125149	455338	223054	117317	19539	333624
12000	245208	22598	48272	278592	115464	475747	102013	50983	140840	457872	223664	104658	18630	331736
12500	241704	22468	47162	275130	108671	470386	99707	51010	139265	452704	220561	93906	17639	324554
13000	238251	22326	46100	271679	103622	464993	97499	50989	137664	447505	217495	92886	16914	317664
13500	229508	21746	44057	262143	103796	449130	93212	49941	133421	432232	209591	84446	17032	303966
14000	221085	21149	42122	252917	97031	433738	89148	48826	129143	417413	201970	77921	16002	290961
14500	216605	19491	40974	248156	94907	425956	86746	45223	118481	409917	197942	71942	15726	283353
15000	212013	17804	39832	243233	110871	417860	84356	41505	107758	402121	193806	68487	18453	275761
15500	206353	17469	38517	237050	113148	407565	81595	40907	105290	392209	188688	68132	13912	266936
16000	200617	17125	37214	230749	118080	397033	78858	40272	102803	382069	183495	65258	19817	258166
16500	197879	16447	36488	227869	113680	392361	77340	38836	98356	377568	181038	65559	19152	253374
17000	195161	15758	35782	224993	120857	387674	75864	37353	93885	373054	178597	62813	20436	248702
17500	190005	14958	34646	219285	112529	378085	73474	35591	88805	363823	173920	61780	19095	241023
18000	184786	14147	33517	213481	107710	368307	71098	33780	83700	354410	169183	60710	18339	233373
18500	181103	14165	32682	209432	99167	361535	69344	33939	83527	347891	165847	57798	16940	227754
19000	177298	14180	31839	205225	93494	354474	67572	34087	83348	341093	162397	56906	16020	222062
19500	175136	15109	31303	202905	87055	350658	66449	36434	88530	337418	160450	50749	14961	218494
20000	172896	16043	30762	200483	81461	346653	65315	38806	93726	333562	158428	46085	14040	214883
20500	171729	16049	30420	199296	77429	344772	64603	38933	93485	331749	157388	46330	13382	212652
21000	170518	16052	30077	198050	72412	342781	63889	39051	93239	329830	156307	45867	12549	210407
21500	167586	15985	29439	194794	67573	337303	62544	38993	92594	324557	153646	46143	11740	206083
22000	164688	15915	28814	191569	63860	331865	61230	38924	91942	319322	151015	48302	11123	201850
22500	161820	15739	28203	188367	61764	326459	59943	38592	90691	314118	148409	49390	10784	197699
23000	158988	15560	27606	185200	58691	321102	58684	38247	89433	308962	145835	50755	10271	193636
23500	156190	15458	27021	182062	56064	315788	57452	38089	88631	303847	143290	51850	9333	189654
24000	153430	15354	26450	178962	53169	310530	56247	37920	87825	298786	140779	52949	9346	185758
24500	150692	15166	25889	175878	52170	305293	55063	37540	86548	293745	138286	54051	9190	181924
25000	147994	14976	25340	172834	49710	300118	53905	37149	85266	288765	135829	55433	8775	178173
25500	145262	14512	24791	169743	48437	294855	52746	36076	82446	283698	133339	56542	8567	174413
26000	142575	14045	24256	166699	46422	289665	51615	34985	79616	278703	130890	57653	8226	170739
26500	139991	14021	23743	163769	44144	284667	50531	34996	79314	273893	128534	57637	7838	167217
27000	137450	13996	23241	160883	43071	279739	49472	35001	79009	269151	126216	58748	7661	163774
27500	134963	13958	22754	158055	40758	274908	48441	34972	78635	264501	123947	60147	7263	160421
28000	132518	13918	22277	155270	39905	270146	47434	34937	78258	259918	121716	60693	7123	157143
28500	130109	13794	21811	152523	37808	265444	46448	34687	77408	255393	119517	61524	6760	153930
29000	127741	13667	21356	149820	36687	260814	45485	34429	76555	250937	117354	61778	6571	150789
29500	125409	13551	20910	147155	34810	256245	44542	34196	75766	246540	115225	62317	6244	147712
30000	123119	13434	20475	144534	34166	251749	43620	33956	74973	242213	113133	62563	6139	144703
30500	120271	13520	19950	141253	32515	246100	42508	34230	75322	236777	110527	63682	5851	141058
31000	117499	13607	19441	138058	32107	240594	41430	34503	73671	231479	107990	66563	5786	137524
31500	115447	13534	19055	135704	30940	236552	40612	34373	75141	227589	106114	68282	5584	134851
32000	113429	13461	18677	133388	30017	232571	39811	34238	74609	223758	104269	69417	5425	132234
32500	111667	13386	18344	131369	28834	229106	39106	34099	74074	220423	102659	70555	5219	129929
33000	109929	13311	18017	129376	27897	225682	38413	33956	73537	217128	101071	71100	5056	127666
33500	108214	13259	17696	127407	27970	222298	37734	33871	73134	213872	99503	71943	5076	125443
34000	106523	13205	17381	125464	27788	218956	37066	33782	72728	210656	97957	72486	5049	123260
34500	104856	13173	17072	123546	26836	215655	36411	33745	72440	207480	96431	72726	4383	121115
35000	103212	13129	16769	121653	27415	212396	35768	33677	72090	204344	94927	73265	4994	119009

REPRESENTATIVE GROUP IV
WEIGHTED USABLE AREA SQUARE FEET)

Qos	129.5R	131.7L	134.9R	136.0L	139.4L	139.6L	140.4R	144.0R	145.3R
5000	58263	69246	187073	10228	39525	141142	95619	165563	54474
5500	55713	104558	177915	10041	36210	149209	102603	147938	51056
6000	54193	138760	172270	9743	33452	156598	109101	131786	47591
6500	53288	171444	168736	9327	30451	163068	114919	116616	43974
7000	46092	203113	145459	8825	30384	169244	120495	102579	40320
7500	42294	235939	133078	8351	27623	176724	126980	90669	37092
8000	50590	268343	158766	7816	25452	184007	133315	79576	33838
8500	47081	290454	147412	7438	22564	184816	134919	71263	31462
9000	41638	310962	130094	7021	20220	185518	136374	63480	29069
9500	36217	315161	112940	6603	17526	177731	131489	56529	26826
10000	32840	317430	102233	6164	15566	170324	126758	49997	24568
10500	34923	310958	108543	5608	14943	159609	119439	43219	21976
11000	32828	304258	101883	5022	10689	150058	112871	36837	19371
11500	29212	313949	90538	5817	8629	149337	112871	40674	22108
12000	26129	323053	80879	6632	8164	148683	112886	44258	24852
12500	23502	326156	72663	6638	7673	145642	111049	42334	24549
13000	23300	328625	71960	6637	7308	142715	109256	40498	24243
13500	21229	323016	65495	6503	7311	136712	105060	37998	23474
14000	19628	317015	60499	6360	6827	131000	101035	35617	22700
14500	18157	316004	55912	5892	6670	127703	98830	31653	20808
15000	17316	314319	53278	5409	7784	124401	96590	27893	18909
15500	17256	310554	53049	5332	7936	120530	93877	26412	18461
16000	16555	306196	50855	5251	8274	116673	91144	24995	18011
16500	16657	306027	51131	5065	7958	114604	89784	23182	17219
17000	15983	305595	49028	4873	8453	112583	88441	21452	16424
17500	15743	301026	48257	4644	7864	109192	86003	19674	15524
18000	15491	296017	47455	4408	7521	105806	83546	17979	14622
18500	14767	293175	45210	4430	6920	103334	81793	17397	14582
19000	14557	289885	44541	4450	6519	100823	79991	16832	14541
19500	12997	289071	39746	4757	6065	99270	78937	17335	15436
20000	11816	287955	36115	5068	5672	97694	77852	17793	16332
20500	11905	288477	36367	5085	5387	96742	77255	17205	16280
21000	11786	288802	35985	5101	5035	95780	76642	16634	16228
21500	11869	286070	36221	5094	4696	93868	75260	16010	16107
22000	12436	283242	37935	5086	4435	91993	73897	15405	15985
22500	12728	280318	38810	5044	4287	90152	72551	14723	15759
23000	13092	277322	39901	4999	4071	88348	71227	14064	15532
23500	13386	274255	40782	4979	3887	86578	69920	13498	15385
24000	13682	271135	41665	4958	3684	84843	68635	12950	15237
24500	13978	267936	42550	4908	3613	83134	67363	12352	15009
25000	14347	264702	43657	4858	3441	81461	66111	11775	14779
25500	14645	261303	44548	4718	3351	79780	64848	11013	14284
26000	14944	257887	45442	4576	3210	78136	63607	10283	13787
26500	14951	254565	45447	4578	3051	76560	62415	9901	13729
27000	15250	251234	46341	4579	2976	75017	61245	9529	13670
27500	15625	247920	47462	4576	2815	73513	60101	9157	13600
28000	15777	244605	47910	4572	2754	72042	58978	8796	13529
28500	16003	241283	48583	4539	2609	70598	57873	8392	13376
29000	16080	237968	48800	4506	2530	69186	56789	8001	13224
29500	16230	234654	49242	4476	2400	67801	55723	7628	13082
30000	16304	231353	49453	4445	2354	66446	54676	7267	12940
30500	16606	226940	50353	4481	2240	64797	53384	7023	12996
31000	17367	222604	52647	4517	2211	63198	52128	6782	13051
31500	17825	219574	54023	4500	2130	61992	51193	6468	12955
32000	18132	216560	54937	4483	2065	60811	50274	6161	12859
32500	18439	213988	55853	4465	1983	59772	49470	5863	12762
33000	18591	211420	56301	4447	1918	58751	48678	5573	12665
33500	18821	208855	56983	4436	1922	57748	47898	5300	12591
34000	18973	206298	57429	4425	1909	56762	47129	5034	12517
34500	19045	203749	57635	4420	1843	55792	46371	4732	12463
35000	19195	201210	58077	4412	1882	54840	45625	4532	12399

REPRESENTATIVE GROUP V
WEIGHTED USABLE AREA (SQ. FT.)

Qms	101.7L	117.0M	118.9L	124.0M	132.8R	139.0L	139.7R	141.6R	143.0L
5000	0	0	0	1220	2864	601	854	14070	1409
5500	6823	0	0	1440	2864	1251	854	14070	1409
6000	13645	0	0	1660	2864	2020	854	14070	1409
6500	20468	0	0	1879	2864	2874	854	14070	1409
7000	27290	0	0	2099	2864	3787	854	14070	1484
7500	34113	0	0	2319	2864	4742	854	14070	1901
8000	37041	124	0	2542	2887	5723	854	14070	3072
8500	39970	247	0	2766	2910	6277	854	14070	4392
9000	42899	371	0	2990	2932	6654	854	14070	5823
9500	45828	495	0	3214	2955	6922	854	14070	7336
10000	48757	618	0	3437	2978	7173	854	14070	8906
10500	65365	742	0	3661	3001	7292	854	14070	9824
11000	79841	1150	0	4332	3035	7164	854	14070	10471
11500	93890	1558	0	5003	3069	6538	854	14070	10950
12000	107564	1966	0	5675	3103	6281	854	14070	11401
12500	120907	2374	0	6346	3137	6338	854	14070	11643
13000	131455	3020	0	7235	3507	5576	854	14070	11488
13500	132066	3667	0	8124	3877	5357	854	14070	10528
14000	129882	4313	0	9013	4248	4930	854	14070	10152
14500	126610	4959	0	9902	4618	4639	854	14070	10281
15000	123909	5606	0	10791	4988	4049	854	14070	9076
15500	119747	6252	0	11681	5358	3510	854	14070	8749
16000	112447	8724	0	12570	5729	3426	854	14070	8077
16500	96990	16417	0	14217	5831	3246	854	14070	7622
17000	88389	25723	0	15865	5933	2943	854	14070	6671
17500	84882	36444	0	17512	6035	2767	854	14070	5799
18000	71271	48413	0	19160	6138	2653	854	14070	5674
18500	65632	52863	0	23663	6588	2699	854	14070	5388
19000	58018	53333	0	28166	7038	2587	854	14070	4897
19500	52533	52670	0	32669	7488	2535	854	14070	4614
20000	44202	51553	0	37172	10039	2511	854	14070	4434
20500	36997	50656	0	41675	12607	2486	854	14070	4521
21000	34911	49149	0	46178	15210	2461	854	14070	4341
21500	32013	46333	0	50681	17843	2435	854	33266	4262
22000	28127	40760	0	55185	20503	2408	854	40925	4229
22500	25651	37885	0	59688	23183	2381	1080	48451	4195
23000	23881	37107	0	64191	24175	2353	4769	55860	4159
23500	24483	32330	0	83361	24270	2325	5460	62864	4122
24000	23657	30843	0	101733	24152	2297	6095	69766	4083
24500	23395	28248	0	119615	24131	2269	6680	71547	4044
25000	23406	26502	0	137109	23808	2241	7220	71829	4003
25500	23421	23107	0	154301	22825	2212	7210	71479	3961
26000	23441	20044	0	171243	20422	2184	7049	71415	3919
26500	23467	19602	0	175614	19308	2156	6831	70460	3876
27000	23497	18631	0	176305	19238	2127	6647	67551	3833
27500	23531	16968	0	175447	16761	2099	6386	60441	3789
28000	23571	16042	0	175290	15990	2071	5962	57142	3745
28500	23614	15485	0	172946	14645	2043	5195	56935	3701
29000	23662	15875	0	165806	13740	2015	4783	49605	3657
29500	23715	15339	0	148353	11980	1988	4641	47324	3612
30000	23771	15169	0	140257	10391	1960	3938	43343	3568
30500	23832	15176	0	139748	10163	1933	3658	40664	3523
31000	23897	15186	0	121758	9659	1906	3263	35455	3479
31500	23966	15199	0	116157	8797	1880	2981	30754	3435
32000	24040	15216	0	106386	8317	1853	2531	30076	3391
32500	24117	15235	0	99810	8028	1827	2138	28586	3348
33000	24198	15258	0	87024	8230	1801	2036	26035	3304
33500	24283	15283	0	75486	7952	1776	1885	24614	3261
34000	24372	15311	0	73823	7864	1751	1672	23759	3218
34500	24465	15343	0	70165	7868	1726	1539	24357	3176
35000	24562	15377	0	63904	7873	1701	1447	23536	3134

REPRESENTATIVE GROUP VI

WEIGHTED USABLE AREA (SQ.FT.)

Qms	102.6L	106.3R	107.1L	117.8L	117.9R	119.7L	133.8L	135.7R	136.3R	138.0R	138.8R	139.5R	140.6R	142.0R
5000	19423	9609	1630	4177	3198	2774	25782	1393	17333	0	540	7420	0	6886
5500	19423	14046	1630	4511	3305	2774	25782	1518	17333	0	1767	7662	0	8388
6000	19423	18373	1630	4845	3412	2774	25782	1643	17333	0	2995	7905	0	9891
6500	19609	22560	1630	5179	3518	2774	25782	1769	17333	0	7025	8143	0	11393
7000	31391	26597	1630	5514	3625	2774	25782	1894	17333	0	9834	8391	0	12895
7500	43952	30477	1630	5848	3732	2774	25782	2019	17333	0	12898	8634	0	14398
8000	56915	34201	1630	7014	6268	2774	25782	2147	17333	765	13692	9443	180	15041
8500	70032	32961	1630	13613	6862	2774	25782	2274	17333	2098	12307	10252	360	15684
9000	83137	31893	1630	16867	7414	2774	25782	2402	17333	3895	13424	11062	540	16328
9500	96116	32168	1630	20308	7929	2774	25782	2530	17333	6077	13209	19751	720	16971
10000	95022	34301	2235	23904	7181	2774	25782	2657	17333	8582	14495	22882	901	17615
10500	93997	33811	2766	23592	7891	2774	25782	2785	17333	11359	14181	26057	1081	18258
11000	96665	31496	3237	28156	7803	2774	25782	3133	17333	20644	13496	30928	10567	28285
11500	104856	30626	3657	30065	8606	2774	25782	3481	17333	27062	13056	30727	20053	39040
12000	104956	30357	4033	35577	8461	2774	25782	3829	17333	32761	13414	36698	29540	50397
12500	99127	29649	4373	37336	7739	2774	25782	4178	17333	39371	12182	39230	53503	62258
13000	97599	29496	4085	34589	7243	2853	25782	4178	17333	42084	11176	45610	67334	72139
13500	97845	28999	10893	32657	7211	2933	25782	4178	25402	41629	10397	47120	80087	81976
14000	96564	28812	21989	32778	6357	3012	25782	4178	33474	38947	10128	45150	91936	80084
14500	96988	28844	33994	29118	5974	3091	25782	4178	41545	38063	11232	43947	103021	78605
15000	96197	27784	42918	27572	5694	3170	25782	4178	49616	37942	10571	45405	113450	80468
15500	96363	30097	47957	26472	5683	3250	25782	4178	57688	37287	9070	41446	107605	87113
16000	97207	30256	53731	26625	6458	3329	25782	4178	65757	37339	9974	40257	102719	87203
16500	94301	30085	59727	30163	6502	3606	25782	4178	61423	36419	9613	40788	103436	94062
17000	102832	29757	64168	29005	5953	3884	25782	4178	62925	35925	9579	43067	110367	103523
17500	104022	29523	69215	25434	6970	4161	42905	4178	62494	35731	9347	51571	108938	114199
18000	104040	29199	72965	28604	6844	4439	49020	4178	65735	34214	8628	52217	101712	122537
18500	103476	28199	77054	27653	6920	4494	55138	4205	64021	37029	11024	46629	101135	122294
19000	103199	27340	81411	27631	6844	4550	61246	4233	60571	37206	11632	53341	102555	120676
19500	102575	25591	82279	27046	6399	4605	59573	4261	59525	36992	11741	51260	102368	120394
20000	99526	27420	93062	25016	8410	4661	66999	4289	59056	36597	11222	50937	104026	121070
20500	96925	32332	97284	32585	9118	4716	69565	4317	58390	36330	10668	49570	104415	117184
21000	91109	32208	100236	35017	9445	4772	77961	4345	57941	35962	10113	45643	105866	127588
21500	98015	32891	102424	35979	9255	4827	77896	4373	58020	34769	9877	59137	108103	128951
22000	116020	32968	104707	34964	9012	4883	72891	4400	57846	33756	9555	63254	106163	128935
22500	116002	33407	106464	33803	8741	4938	69058	4428	58160	31646	9022	64691	117199	128265
23000	118877	33433	105485	32569	8728	4994	70109	4456	56261	33967	8514	62624	120020	128011
23500	119560	33450	104739	32463	8622	8551	65097	4586	61233	40864	8440	60784	121388	128956
24000	121543	33742	100242	32079	8313	9544	63772	4720	61823	41545	8348	58833	122184	126896
24500	122017	34868	109663	30917	8012	10515	64241	4858	61724	43309	8402	58670	123418	125405
25000	122446	35426	131858	29804	7943	11468	68329	5000	61335	44326	8450	57957	124329	119688
25500	123872	36041	133786	29548	7857	10592	83118	5146	61165	45874	8500	55883	122343	130801
26000	128358	36716	139005	29221	7907	11871	86653	5296	60652	46900	8552	53859	120906	157361
26500	130762	37528	141629	29416	7952	12001	78466	5450	58896	47946	8606	53390	115394	159981
27000	133377	38323	145751	29586	8000	13531	89063	5609	57443	49429	8662	52813	126109	166774
27500	136211	37398	148020	29762	8049	13601	85639	5773	56984	52210	8719	53149	151715	170693
28000	139558	36561	150175	29944	8099	12719	84280	9886	61062	54233	8777	53457	154242	176653
28500	142847	35745	153510	30132	8151	12114	81525	11035	72037	56419	8838	53775	160791	180602
29000	139714	34951	160646	30326	8205	12277	80617	12157	71811	58780	8900	54104	164569	184632
29500	136885	34177	165197	30526	8260	11017	110036	13259	73402	61455	8964	54444	170315	190341
30000	134115	33423	170015	30732	8317	10541	120243	12246	73704	64203	9029	54794	174123	201052
30500	131404	32689	175114	30943	8376	10230	121790	13724	74834	64106	9096	55155	173008	208840
31000	128751	31973	180886	31161	8436	10396	116372	13875	75065	64133	9165	55527	183512	217260
31500	126154	31276	186597	31384	8497	12032	110593	15644	75263	64174	9235	55910	193840	226352
32000	123613	30596	183872	31613	8560	11819	104963	15725	76099	64228	9307	56302	201348	236652
32500	121128	29934	181442	31848	8625	10587	102857	14704	78841	64296	9381	56706	209466	247233
33000	118696	29288	178996	32088	8691	12155	99820	14005	80331	64376	9456	57119	218232	246861
33500	116317	28659	176538	32335	8759	11732	93745	14194	81975	64470	9533	57543	228162	246964
34000	113990	28045	174074	32587	8828	11715	88068	12737	83776	64575	9612	57978	238363	247121
34500	111714	27447	171608	32845	8899	11463	85096	12186	85921	64694	9692	58423	238005	247330
35000	109487	26863	169144	33108	8972	10618	82027	11827	88056	64824	9774	58879	238104	247590

REPRESENTATIVE GROUP VII
WEIGHTED USABLE AREA (SQ. FT.)

	114.1R	119.2R	121.1L	123.0L	125.6L	127.5M	131.3L
5000	78609	18599	11704	13230	68073	83555	7031
5500	83542	19343	15848	14235	70482	88363	7650
6000	88269	20087	20565	15193	72840	92983	10057
6500	36868	20831	25857	15079	70328	91191	12731
7000	83153	21575	31720	14539	66206	87031	15673
7500	91305	22319	38162	16064	71632	95314	18832
8000	90629	30010	40965	16033	70171	94392	25171
8500	85794	38720	47242	15251	65645	89173	28647
9000	81406	48449	54117	14533	61622	84457	32513
9500	76939	59194	58246	13789	57673	79690	33852
10000	70562	74555	70269	12690	52419	72975	34318
10500	63849	78545	75392	11520	47041	65940	44964
11000	58236	82523	76216	10538	42578	60067	51141
11500	53646	80932	76517	9733	38944	55268	54005
12000	48136	77324	75964	8755	34713	49538	56091
12500	45803	84841	72755	8350	32826	47089	57223
13000	42667	84222	68423	7795	30401	43824	56047
13500	38771	79786	64608	7097	27473	39786	53708
14000	35727	75796	61410	6553	25186	36632	51530
14500	31573	71747	56696	5801	22149	32348	49659
15000	28049	65919	55373	5162	19585	28716	46402
15500	26203	59767	52833	4830	18216	26807	45803
16000	24563	54629	49083	4534	17005	25113	44117
16500	23038	50436	46167	4259	15886	23539	41332
17000	21618	45361	41586	4001	14849	22074	39175
17500	20295	43264	37609	3761	13891	20712	35532
18000	19062	40398	35725	3537	13001	19443	32337
18500	17912	36796	34019	3327	12176	18260	30895
19000	16841	33988	32382	3132	11411	17160	29576
19500	15841	30108	30811	2949	10701	16134	28291
20000	15576	26811	29310	2903	10491	15857	27041
20500	15317	25105	27874	2857	10287	15586	25833
21000	15063	23588	26504	2812	10088	15321	24664
21500	14814	22175	25202	2768	9896	15062	23539
22000	14571	20854	23961	2725	9708	14809	22460
22500	14333	19622	23803	2683	9526	14561	21424
23000	14100	18469	23636	2641	9349	14319	21347
23500	13872	17393	23463	2601	9176	14083	21259
24000	13647	16387	23283	2560	9007	13849	21161
24500	13429	15446	23097	2521	8844	13624	21053
25000	13214	15219	22908	2483	8684	13402	20937
25500	13004	14996	22715	2445	8529	13184	20814
26000	12799	14776	22518	2408	8378	12973	20684
26500	12599	14560	22316	2372	8231	12766	20549
27000	12401	14348	22116	2336	8086	12563	20406
27500	12206	14139	21911	2301	7945	12362	20262
28000	12019	13935	21705	2267	7809	12168	20112
28500	11831	13734	21500	2232	7673	11975	19958
29000	11650	13535	21294	2200	7543	11789	19803
29500	11469	13342	21086	2167	7414	11603	19646
30000	11296	13151	20874	2135	7290	11425	19484
30500	11124	12963	20668	2103	7168	11249	19318
31000	10955	12780	20456	2073	7048	11075	19155
31500	10790	12600	20250	2042	6931	10906	18985
32000	10627	12422	20038	2012	6817	10739	18820
32500	10468	12245	19833	1983	6705	10575	18647
33000	10311	12075	19626	1954	6596	10415	18480
33500	10157	11904	19419	1926	6488	10258	18309
34000	10006	11740	19213	1898	6383	10103	18137
34500	9858	11574	19007	1871	6281	9952	17965
35000	9712	11416	18803	1844	6180	9803	17793

REPRESENTATIVE GROUP VIII
WEIGHTED USABLE AREA (SQ. FT.)

Qms	101.3M	102.0L	104.3M	109.5M	112.4L	117.1M	117.2M	118.6M	119.8L	120.0L	121.5R	121.6R	123.2R	124.8R
5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9500	7198	0	0	0	0	0	0	0	0	0	0	0	0	0
10000	8377	9757	0	0	0	0	0	0	0	0	0	0	0	0
10500	9433	13541	0	0	0	0	0	0	0	0	0	0	0	0
11000	10444	13947	0	0	0	0	0	0	0	0	0	0	0	0
11500	11365	14291	0	0	0	0	0	0	0	0	0	0	0	0
12000	12170	14673	0	0	0	0	0	0	0	6728	0	0	0	0
12500	12892	15011	0	0	0	0	0	0	0	9973	0	0	0	0
13000	13584	15265	0	0	0	0	0	0	0	12357	0	0	0	0
13500	14211	15476	0	0	0	0	0	1398	0	12131	0	0	0	0
14000	14315	15702	0	0	0	0	0	2089	0	11901	0	0	0	0
14500	14313	15893	0	0	0	0	0	4789	0	11746	0	0	0	0
15000	14542	15552	0	0	0	16995	0	5315	0	11588	0	0	0	0
15500	14704	15155	0	0	0	29606	0	5793	0	11396	0	0	0	0
16000	14389	15046	0	0	0	40799	0	6267	16963	11201	0	38460	0	0
16500	13981	14903	0	0	0	41798	0	6704	16650	11042	0	43493	0	0
17000	13323	14312	0	0	0	42657	0	7087	16332	10882	0	48092	0	0
17500	12571	13672	0	0	0	43670	0	7435	16116	10384	0	52624	0	0
18000	12224	12827	0	0	0	44578	0	7777	15897	9883	0	56830	0	0
18500	11822	11931	0	0	0	45263	0	8039	15633	9598	0	60562	0	0
19000	12099	11450	0	0	0	45845	0	8113	15365	9310	0	63973	0	0
19500	12365	10939	0	0	0	46487	0	8084	15146	8766	0	67307	0	0
20000	11780	11070	0	0	0	47045	0	8192	14925	8218	6641	70378	0	9174
20500	11143	[illegible]	0	0	0	46038	0	8268	14242	7574	12408	70913	0	16887
21000	10991	10561	0	0	0	44874	0	8079	13555	6927	21385	70957	0	28744
21500	10815	9899	1358	0	0	44575	0	7842	13163	6542	28605	72176	0	33042
22000	11086	9680	3176	0	0	44178	0	7468	12768	6155	37140	73094	0	48945
22500	11353	9449	5056	2562	4151	42459	0	7043	12022	6138	43961	71648	0	57476
23000	11166	9612	6293	4719	7097	40595	0	6848	11272	6120	50321	69752	0	65336
23500	10959	9773	7651	8039	11297	38121	1778	6623	10389	5696	56079	66603	3575	72365
24000	10745	9547	8526	10648	14061	35493	3167	6780	9502	5271	61081	62974	6407	78389
24500	10512	9310	9231	13712	17095	34100	5240	6931	8974	5091	66066	61373	10656	34371
25000	10651	9072	9770	16115	19051	32614	6764	6606	8443	4910	68777	59484	13822	87444
25500	10786	8824	10142	18335	20627	33043	8513	6252	8420	4937	69393	61018	17471	87873
26000	11025	8892	10488	20324	21830	33455	9802	6170	8396	4965	67594	62499	20136	85281
26500	11263	8958	10468	22035	22661	31598	10949	6076	7815	4799	64266	59675	22639	80811
27000	11196	9110	10151	23737	23434	29652	11936	6232	7232	4631	58729	56575	24763	73620
27500	11121	9262	9524	24622	23388	29033	12745	6387	6985	4468	52359	55930	26523	65449
28000	10890	9165	8740	24763	22680	28373	13540	6287	6738	4305	46606	55157	28258	58105
28500	10646	9064	7724	24053	21281	28897	13867	6175	6776	4297	41179	56661	29017	51213
29000	11596	8838	6670	22810	19529	29417	13784	6059	6814	4290	36780	58151	28914	45639
29500	10356	8606	5760	20797	17257	28772	13244	5933	6586	4325	32599	57317	27845	40365
30000	10303	9338	4944	18503	14903	28093	12434	6017	6357	4360	28701	56375	26199	35467
30500	10248	8308	4295	16439	12869	27408	11231	6099	6134	4279	25096	55336	23712	30955
31000	10193	8236	3707	14500	11046	26691	9906	6239	5910	4198	22147	54296	20953	27270
31500	10136	8164	3182	12931	9597	26929	8730	6379	5900	4062	19851	55127	18498	24403
32000	10080	8093	2716	11445	8284	27159	7642	6347	5891	3925	17931	55936	16220	22008
32500	10023	8023	2342	10064	7111	27654	6766	6310	5939	4227	16205	57285	14385	19861
33000	9966	7954	2052	8790	6068	28147	5948	6185	5987	3735	14874	58631	12665	18204
33500	9908	7885	1814	7749	5232	27886	5197	6052	5877	3676	13542	58396	11082	16552
34000	9766	7818	1606	6938	4585	27608	4512	6598	5766	3619	12837	58108	9634	15671
34500	9609	7750	1444	6262	4053	26952	3955	5897	5579	3564	11844	57005	8456	14441
35000	9472	7619	1290	5654	3587	26272	3523	5872	5392	3510	11184	55829	7541	13621

REPRESENTATIVE GROUP VIII

WEIGHTED USABLE AREA (SQ. FT.)

Qms	125.6R	128.4R	132.5L	135.0R	135.1R	144.0M	145.6R	146.6L
5000	0	0	0	0	0	0	0	0
5500	0	0	0	0	0	0	0	0
6000	0	0	0	0	0	0	0	0
6500	0	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0	0
7500	0	0	0	0	0	0	0	0
8000	0	0	0	0	0	0	0	0
8500	0	0	0	0	0	0	0	0
9000	0	0	0	0	0	0	0	0
9500	0	3146	0	0	0	0	0	0
10000	0	6738	0	0	0	0	0	0
10500	0	9992	0	0	0	0	0	0
11000	0	13021	0	0	0	0	0	0
11500	0	15804	0	0	0	0	0	0
12000	0	18309	0	0	0	0	0	0
12500	0	20589	0	0	0	0	0	0
13000	0	22737	0	0	0	0	0	0
13500	0	24705	0	0	0	0	0	0
14000	0	25678	0	0	0	0	0	0
14500	0	26359	0	0	0	0	0	0
15000	0	27388	23720	0	0	0	0	0
15500	0	28238	24366	0	0	0	0	0
16000	0	28104	24924	0	0	0	0	0
16500	0	27720	25566	0	0	0	0	0
17000	0	26767	26142	0	0	0	0	0
17500	0	25558	26583	0	0	0	0	0
18000	0	25121	26960	0	0	0	0	0
18500	0	24530	27368	0	0	0	0	0
19000	0	25329	27724	0	0	0	0	0
19500	0	26095	27155	0	0	0	0	0
20000	0	25045	26489	0	0	0	0	0
20500	0	23853	26330	0	4610	0	0	0
21000	0	23677	26112	0	8494	0	0	0
21500	0	23435	25109	0	14471	0	15056	0
22000	0	24152	24019	0	19168	0	26407	0
22500	0	24860	22565	0	24680	9070	43063	0
23000	0	24568	21018	0	29001	11289	54853	0
23500	0	24221	20200	12255	32987	13726	68186	0
24000	0	23847	19325	21903	36556	15296	77615	0
24500	0	23423	19585	36341	39620	16561	85762	0
25000	0	23822	19834	47035	42665	17528	92559	0
25500	0	24209	18737	59335	44239	18195	97906	0
26000	0	24828	17587	68470	44476	18815	103092	0
26500	10403	25444	17223	76627	43182	18779	104702	0
27000	18417	25370	16834	83689	40934	18210	103253	684
27500	30296	25271	17147	89515	37305	17086	98468	1196
28000	38909	24814	17458	95247	33177	15680	91794	1944
28500	48705	24323	17078	97689	29464	13856	82357	2469
29000	54276	26559	16676	97235	25977	11966	72174	3061
29500	58765	23776	16271	93544	23157	10332	63217	3475
30000	62194	23707	15847	87928	20487	8869	55016	3832
30500	64563	23632	15989	79511	18006	7705	48443	4127
31000	66763	23555	16127	70201	15720	6651	42363	4358
31500	66634	23471	16421	61927	13852	5709	36826	4581
32000	64616	23387	16715	54258	12399	4872	31816	4645
32500	60629	23297	16561	48085	11184	4201	27759	4574
33000	55639	23207	16396	42309	10096	3682	24613	4357
33500	49166	23112	16007	36997	9256	3254	22004	4057
34000	42459	22819	15603	32144	8417	2880	19692	3636
34500	36664	22488	16949	28197	7971	2591	17906	3183
35000	31470	22201	15097	25132	7347	2314	16158	2785

REPRESENTATIVE GROUP IX

WEIGHTED USABLE AREA (SQ.FT.)

Qms	101.5L	104.0R	105.7R	108.9L	109.4R	111.0R	113.8R	117.7L	127.1M	128.3R	129.3L	129.8R	131.2R	135.0L
5000	42266	26738	9799	9604	35604	26124	3650	5414	9836	20858	5130	16356	5132	8819
5500	45704	27654	8792	8645	36716	27230	3297	5843	9411	20024	4679	14645	5389	8910
6000	51398	29959	9216	9087	39677	29801	3476	6560	10409	22207	4976	15322	5916	9452
6500	56015	31625	9084	8978	41790	31690	3444	7140	10741	22964	4968	15076	6316	9792
7000	59394	32619	8517	8437	43017	32899	3245	7562	10479	22445	4711	14113	6581	9927
7500	62802	33664	8213	8153	44315	34151	3143	7988	10465	22448	4590	13591	6853	10086
8000	62478	32777	8504	8458	43076	33426	3267	7940	11177	24007	4798	14054	6727	9679
8500	68927	35471	9011	8976	46546	36346	3474	8753	12176	26132	5127	14873	7333	10334
9000	81895	41418	9556	9535	54275	42625	3696	10393	13241	28501	5480	15756	8621	11917
9500	79223	39439	8970	8963	51616	40752	3480	10048	12715	27393	5181	14774	8259	11216
10000	81258	39873	9366	9372	52123	41353	3644	10300	13556	29229	5447	15411	8398	11216
10500	81014	39230	9095	9113	51225	40827	3549	10264	13419	28954	5323	14952	8306	10922
11000	79897	38220	9378	9408	49854	39902	3668	10118	14084	30407	5520	15403	8131	10538
11500	76129	36007	9134	9174	46922	37705	3581	9637	13945	30125	5407	14990	7696	9837
12000	72614	33985	8809	8857	44247	35687	3462	9189	13656	29517	5241	14446	7295	9204
12500	69583	32248	9542	9603	41949	33953	3758	8802	15005	32450	5705	15636	6949	8661
13000	76884	35305	9477	9548	45888	37264	3740	9723	15106	32681	5693	15520	7637	9407
13500	75886	34547	9909	9992	44867	36550	3918	9594	15994	34619	5979	16217	7500	9136
14000	79159	35745	10652	10751	46389	37902	4219	10005	17399	37673	6454	17421	7786	9385
14500	78195	35039	9112	9204	45442	37232	3615	9881	15051	32602	5543	14893	7657	9136
15000	77524	34487	9503	9607	44696	36719	3777	9793	15865	34377	5803	15523	7559	8932
15500	79356	35060	10092	10210	45409	37401	4017	10023	17019	36888	6184	16476	7707	9023
16000	75938	33331	10998	11135	43143	35621	4385	9589	18725	40599	6763	17945	7347	8525
16500	72585	31661	11121	11267	40958	33896	4440	9163	19108	41442	6861	18136	6997	8050
17000	70341	30501	9857	9994	39435	32709	3941	8878	17086	37065	6101	16068	6758	7711
17500	73635	31749	10927	11087	41026	34102	4375	9292	19099	41443	6784	17804	7051	7983
18000	72743	31195	11485	11660	40290	33559	4604	9178	20235	43919	7152	18705	6944	7302
18500	69665	29721	12406	12603	38366	32020	4980	8789	22024	47314	7747	20195	6631	7395
19000	77678	32975	12248	12449	42547	35576	4922	9798	21903	47561	7669	19929	7373	8163
19500	78429	33135	12329	12539	42734	35798	4961	9891	22203	48223	7740	20052	7424	8163
20000	79160	33291	11924	12133	42915	36014	4803	9982	21620	46965	7505	19385	7473	8163
20500	79873	33443	11839	12054	43093	36225	4774	10070	21607	46946	7470	19240	7522	8163
21000	93737	39082	11672	11890	50337	42385	4712	11817	21436	46583	7382	18961	8806	9498
21500	95878	39811	12196	12430	51256	43227	4929	12085	22534	48978	7731	19805	8986	9633
22000	99157	4[illegible]	2804	13056	52779	44581	5179	12497	23796	51730	8135	20785	9273	9882
22500	101772	41932	13045	13308	53944	45634	5282	12825	24381	53011	8306	21169	9497	10063
23000	103016	42288	13492	13771	54382	46071	5468	12980	25355	55137	8609	21887	9593	10108
23500	103785	42452	14394	14698	54574	46298	5839	13076	27194	59145	9203	23343	9646	10108
24000	104771	42708	14886	15208	54883	46625	6044	13199	28269	61492	9537	24134	9719	10131
24500	106452	43249	15007	15338	55559	47262	6099	13409	28641	62309	9633	24322	9856	10221
25000	108369	43885	15045	15382	56357	48003	6119	13649	28851	62774	9675	24375	10015	10334
25500	111957	45196	14915	15256	58022	49483	6071	14100	28736	62532	9609	24157	10329	10606
26000	121576	48929	14908	15255	62795	53619	6074	15310	28854	62798	9622	24140	11197	11442
26500	124281	49869	14692	15040	63982	54698	5990	15649	28562	62169	9499	23783	11428	11623
27000	126023	50423	14852	15209	64673	55353	6060	15867	28996	63121	9618	24035	11569	11714
27500	128497	51269	15095	15464	65739	56328	6164	16177	29595	64432	9792	24422	11778	11872
28000	129253	51430	14665	15028	65927	56552	5993	16271	28868	62857	9528	23719	11829	11872
28500	129997	51589	14189	14546	66112	56772	5803	16363	28043	61068	9234	22945	11880	11872
29000	128735	50956	13627	13974	65283	56119	5576	16203	27036	58880	8881	22029	11748	11691
29500	126497	49944	13358	13703	63970	55047	5470	15920	26603	57943	8719	21589	11527	11425
30000	124096	48876	13683	14041	62585	53909	5607	15617	27350	59575	8944	22109	11293	11148
30500	122724	48219	15455	15865	61729	53224	6338	15443	31004	67543	10118	24967	11154	10967
31000	120303	47158	15102	15507	60355	52089	196	15137	30401	66235	9900	24390	10920	10696
31500	119119	46587	14660	15059	59610	51494	6019	14987	29614	64526	9624	23672	10799	10538
32000	119706	46712	14817	15224	59756	51668	6087	15060	30030	65437	9740	23919	10838	10538
32500	117961	45931	14415	14816	58743	50838	5926	14840	29311	63878	9488	23265	10668	10334
33000	116444	45244	13796	14184	57851	50110	5675	14648	28144	61338	9093	22262	10518	10153
33500	114900	44551	13348	13727	56953	49374	5493	14453	27313	59533	8808	21533	10367	9972
34000	113067	43751	12983	13355	55918	48517	5346	14222	26648	58088	8578	20941	10190	9769
34500	111206	42945	12660	13026	54876	47653	5216	13987	26063	56817	8375	20415	10011	9565
35000	110108	42438	12248	12607	54217	47119	5049	13848	25290	55137	8113	19748	9902	9430

REPRESENTATIVE GROUP IX
WEIGHTED USABLE AREA (SQ.FT.)

Qms	139.2R	141.2R	141.3R	142.8R	144.2L	147.1L
5000	13200	4047	10355	23024	51776	14190
5500	12066	3792	9599	21087	45788	12787
6000	12855	4125	9932	22502	47373	13454
6500	12852	4198	9673	22531	46140	13305
7000	12205	4048	8972	21424	42794	12513
7500	11906	4002	8566	20923	40857	12101
8000	12458	4238	8787	21914	41914	12561
8500	13326	4582	9230	23462	44027	13340
9000	14257	4949	9710	25122	46317	14178
9500	13491	4724	9046	23791	43147	13335
10000	14193	5010	9378	25046	44732	13949
10500	13879	4935	9046	24509	43147	13570
11000	14404	5156	9267	25451	44203	14014
11500	14116	5085	8972	24956	42794	13671
12000	13692	4961	8603	24219	41033	13204
12500	14912	5432	9267	26390	44203	14322
13000	14888	5451	9156	26360	43675	14245
13500	15643	5754	9526	27708	45436	14912
14000	16893	6242	10190	29934	48606	16049
14500	14514	5386	8676	25729	41386	13744
15000	15201	5663	9009	26957	42971	14350
15500	16207	6060	9526	28751	45436	15255
16000	17730	6654	10338	31463	49310	16641
16500	17994	6776	10412	31942	49663	16843
17000	16006	6047	9193	28422	43851	14943
17500	17804	6747	10153	31623	48430	16580
18000	18774	7135	10633	33355	50719	17442
18500	20342	7753	11446	36152	54594	18856
19000	20143	7698	11261	35807	53713	18630
19500	20335	7792	11298	36157	53889	18767
20000	19722	7576	10892	35076	51952	18164
20500	19636	7561	10781	34930	51424	18049
21000	19409	7491	10596	34534	50543	17806
21500	20332	7864	11039	36184	52657	18618
22000	21398	8295	11556	38089	55122	19559
22500	21853	8488	11741	38907	56003	19940
23000	22655	8817	12110	40342	57764	20636
23500	24224	9446	12885	43144	61462	22029
24000	25108	9809	13292	44726	63399	22797
24500	25365	9928	13365	45193	63751	22995
25000	25481	9991	13365	45407	63751	23065
25500	25312	9941	13218	45113	63047	22878
26000	25351	9973	13181	45190	62871	22881
26500	25031	9863	12959	44626	61814	22561
27000	25350	10004	13070	45201	62343	22817
27500	25812	10202	13255	46032	63223	23202
28000	25120	9943	12849	44806	61286	22552
28500	24348	9652	12405	43435	59173	21831
29000	23422	9298	11889	41789	56707	20975
29500	22999	9142	11630	41038	55474	20571
30000	23595	9391	11889	42108	56707	21030
30500	26695	10639	13402	47646	63927	23822
31000	26124	10424	13070	46633	62343	23286
31500	25399	10148	12664	45345	60405	22615
32000	25708	10283	12775	45901	60934	22866
32500	25047	10031	12405	44727	59173	22255
33000	24007	9625	11852	42873	56531	21308
33500	23258	9335	11446	41541	54594	20623
34000	22653	9103	11113	40465	53009	20067
34500	22119	8898	10818	39515	51600	19575
35000	21429	8629	10449	38286	49839	18946