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FLOW COMPUTATION OF RIVER ESTUARIES USING FINITE ELEMENT MODEL

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ABSTRACT

A large percentage of our population live in coastal areas. In coastal areas, where complex interaction between physical, chemical and biological processes are found, water circulation is one of the most important factors controlling those processes. Thus, the study of the actual hydrodynamic regime and proper management of estuaries, lagoons and coastal regions due to high tides, peak flows erosion, sedimentation and pollutant load discharges are essential.

Many problems of hydraulic engineering require information concerning water heights and currents in the two-dimensional horizontal domain. Typical cases involves bays, estuaries, harbours and wide rivers. Recent advances in computation technology allows us to use sophisticated numerical methods for the analysis of such problems. Because of the relative ease and economy of computations on one hand and the ever growing demand for reliable information on the other hand, mathematical modelling has become a useful tool in the field of hydraulic engineering. In the beginning, the modelling was carried out by finite difference methods. But the complex topography and irregular boundaries of two-dimensional cases require a better and more reliable scheme if detailed information is desired. The finite element technique meets the above requirement. In recent years, the finite element method has been used to develop two-dimensional models for the simulation of bays, estuaries, harbours and lakes.

In the present study a hydrodynamic two-dimensional model (FESWMS-2DH) has been used to compute the two dimensional flow velocity and water surface

profiles due to interaction of high tide and peak flow from the Saptmukhi river estuary(east and west gullies) and Storag Lacam's channel of the Western Sundarbans Delta of West Bengal. In the Western area there are inadequate security against tides and waves resulting in occasional damage of crops, loss of life and property, difficulties in maintaining the huge length of embankments, lack of proper drainage facilities and insufficient sweet water resources. All these deficiencies have provided hindrance to an all-round development of the region which has immense potentialities otherwise.

The present study is aimed to (i)compute the effect of tides(neap tides and spring tides), (ii) effect of different flow conditions(normal and peak flow conditions) and (iii) sensitivity of model parameters. The results obtained have been compared with the observed flow data of the river estuary.

1.0 INTRODUCTION

Estuaries are often centres of population and industries, and as such are used as commerce routes to the sea, convenient dump sites for disposing waste and in many place like, Sundarbans delta, these are used for preservation of wild life and biotic habitats. They also serve as sinks for sediment load, which, in turn, causes drainage congestion and give rise to intrusion of salt water in rivers and salt water intrusion in the aquifers,etc.. These natural phenomena may eventually transform an eco-sound area towards an ecologically imbalance area or may give rise to many other problems originating from tides and waves, if management aspects are disregarded. Hence a proper estuarial management becomes apparent.

Use and maintenance of coastal areas and near shore structures require an adequate knowledge of the waves, tides, and current in the near shore zone. The prediction of the fate of hydrodynamic regime of an estuary is, therefore, not an easy task as the flow dynamics is governed by astronomical tides, surface(i.e.wind) stresses, wind generated surface waves, the coriolis force(caused by the earth's rotation), the geometry of the water body roughness characteristics of the sedimentary material of the bed and interaction between fresh and saline water flow. Any development approach undermining the estuarial flow phenomena would not solve the problem rather may lead to the serious environmental hazards.

Many approaches can be worked out to model the estuarial flow dynamics and sediment transport processes, however, their basic phenomena cannot be delinked from the two basic principles;(i) conservation of mass, and (ii) conservation of momentum. Having considered these two principles, the FESWMS-2DH model developed by USGS for simulating the depth averaged horizontal velocities and water depth of surface-water flow problems has been found successfully used in various corners of the world.

The report addresses the application of FESWMS-2DH model to simulate the hydrodynamic regime in an estuary. To demonstrate the predicting capabilities of the model and for interpretation of the results, the flow dynamics of the Western Sundarbans delta, Saptmukhi and Storag Lacam's channel in particular have been studied.

1.1 Estuarial Problems

Problems that usually endanger an estuarial are mainly tidal origin. The tidal processes can broadly be classified as :(I) rising period, known as ebb tide, and (ii) recession period, known as neap tide. During rising period, fluxes of sea water reverses the natural gradient of surface and groundwater flow. In addition, bottom sediments of deltaic surface stream which are of short aged and have not got their permanent seats, gets uplifted. Again, during the neap period, flow is pushed off and the natural surface and groundwater flow gradients go back to their normal slopes. During these processes, due to concentration gradient, and other kinetic and dynamics of flow, mixing of saline and freshwater takes place and surface and groundwater sources get contaminated. During recession period, washed off silts again get deposited and over passage of time, these silts get permanent deposition. These processes finally lead to the problems of availability of freshwater sources, excessive silt deposition, formation of islands, entry of saline water to the agricultural fields, degradation of aquatic habitats, etc..

Fig.1 is a schematic depiction of transport and shoaling processes in the mixing zone of a stratified estuary. As indicated, river borne sediments from upstream freshwater sources after arriving in the estuarial mixing zone, the large aggregates formed by the associated shearing rates and saline water settles to the lower portion of the water column due to their high settling velocities; the remainder will be carried upstream near the bottom until periods close to slack water permit deposition, after which the sediment starts to undergo self weight consolidation. Net deposition, i.e., shoaling, will occur when the bed shear during flood, as well as during ebb, is insufficient to resuspend all of the material deposited during preceding slack period. Some of the resuspended sediment will be reentertained throughout most of the length of the mixing zone to level above the sea water-freshwater interface, and will be transported downstream as before. At the seaward end some material may be transported out of the system, apportion of which could ultimately return with the net upstream bottom current.

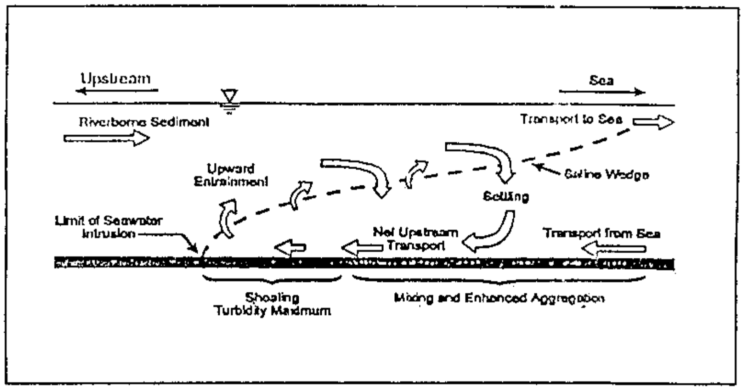

Fig.1: Schematic Representation of Transport and Shoaling Processes in the Mixing Zone of a stratified Estuary.

2.0 DESCRIPTION OF THE STUDY AREA

The coastal forest belt of the Bay of Bengal on the southern most fringes of West Bengal is known as the Western Sundarbans. The whole of the West Sundarbans area is interspersed with an intricate network of criss-cross channels and creeks, big or small, which divide the area into a large number of islands. These channels ultimately find their way to the Bay of Bengal through one or other of the principal estuaries; these are starting from the Hugli towards east, the Saptamukhi, the Thakuran, the Matia and the Gosaba(**Fig.2**).

The tidal motion in the rivers and estuaries of the Sundarbans originate from the tide in the head reach of the Bay of Bengal. The differences in the phase of the tide, whether in the deeper parts of the Bay or along the coast of the west Sundarbans areas, are very small. Consequently, at about equal distances from the sea face, the tides do not differ appreciably in the phase, and as a result the flow in the cross channels inter-connecting the main river in the east-west direction is small.

The tides in the head of the Bay of Bengal are predominantly semi-diurnal with some influence of the diurnal constituent which result in the diurnal inequality between the heights of the two daily high water levels or two daily low water levels. Relatively strong solar constituents are also present and there is a significant variation in the tidal range from spring tide to mean tide viz., from about 4.5 or 5 metres in the spring tide to about 1.5 metres or even less in the neap tide with an average range of about three metres at existing gauge at Sagar.

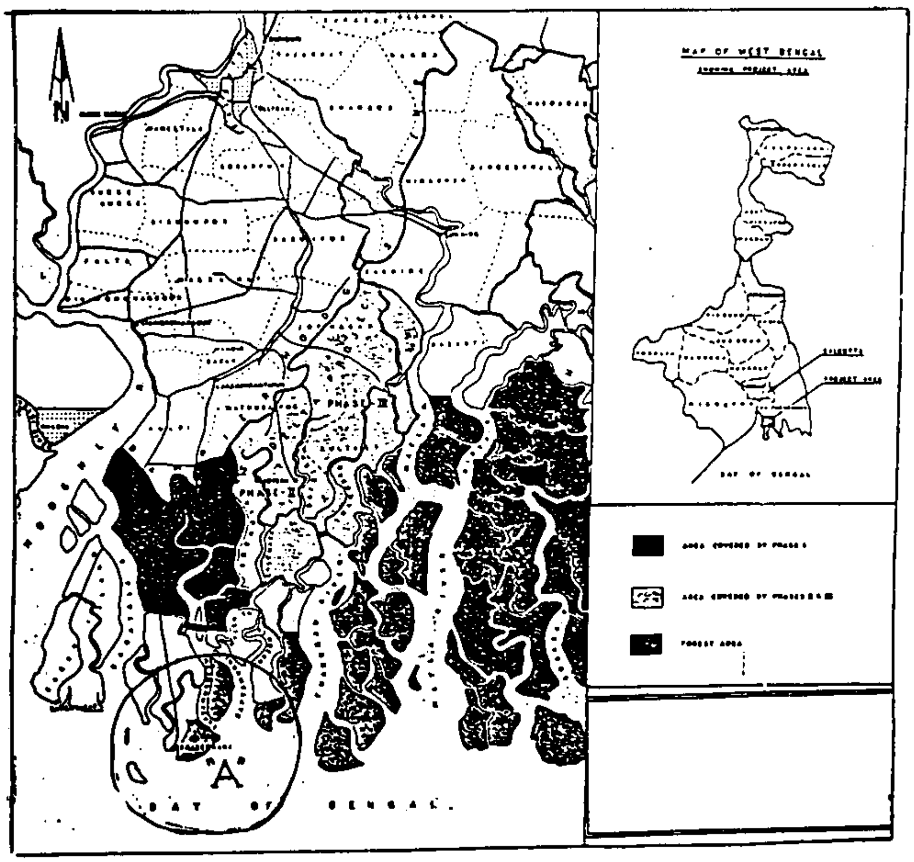

Fig.2: Index Map of the Western Sundarbans Area

The tidal range increases during the propagation of the tide inland. Thus, at a distance of about 40 km from the sea face, the tidal range is about 5.4 metres at spring tide, 3.6 metres at mean tide and 1.8 metres at neap tide. The average speed of the propagation of tide is about 60 km per hour.

The tidal range on a particular day can be expressed by a tidal coefficient (T.C.) which may be defined as the ratio expressed in percentage that the tidal range on this day bears with the main tidal range, the T.C. corresponding to the mean range being 100. The tidal coefficient at the Sagar gauge is found to vary between 40 and 160 at the extremes. For the spring, mean and neap tides tidal coefficient of 150, 100 and 50 respectively have been considered.

There is also a considerable difference among the volume and intensifies of flow in spring, mean and neap tides. Thus, the flood volume i.e., the volume of flow passing a cross section throughout the flood tide in the Saptmukhi river (East and West Gullies combined) at the sea face is of the order of 43750 million cubic metres, 500 million cubic metres and 200 million cubic metres in spring, mean and neap tides respectively.

Right at the sea face, the flood volume of the Saptmukhi river is divided over the two main branches viz., the East Gully and the West Gully(**Fig.3**). At this point, the former is the more important branch carrying the major portion of the flow from the sea. The East and the West Gullies again meet together to the north of the Prentice Island, and the total combined flood flow at this junction is of the order of 30 million cubic metres at mean tide i.e., about six percent of the flood flow at the month.

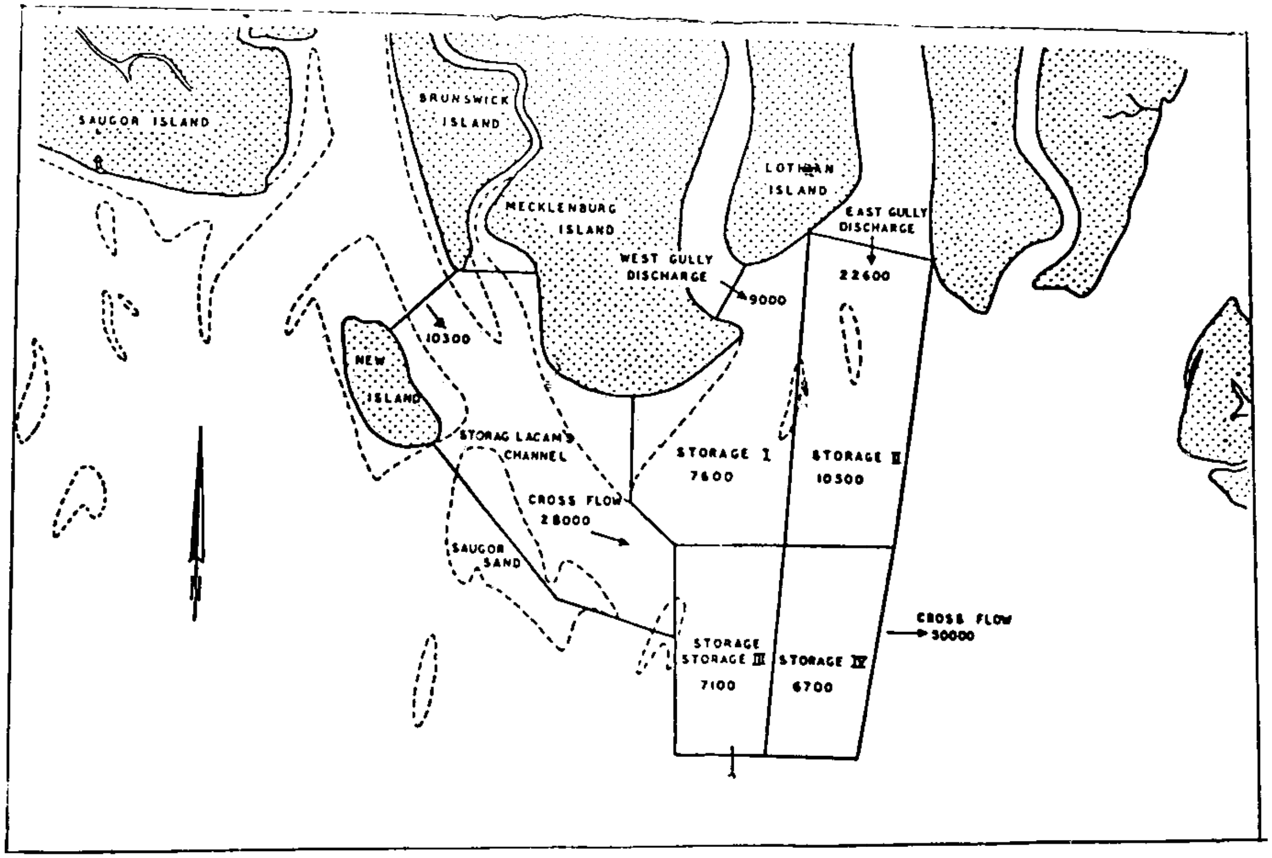

Fig.3: The Study Area

3.0 The FESWMS Model

The Finite Element Surface Water Modelling System: Two-Dimensional Flow in a Horizontal Plane(FESWMS-2DH) model developed by the US-Geological Survey, Water Resources Division (1989),simulates steady and Unsteady flow where the flow is essentially two-dimensional in a horizontal plane. In many surface-water flow problems, the three-dimensional nature of the flow is of secondary importance, particularly when the width-to-depth ratio of the water body is large. In such cases, two-dimensional flow approximations can be used to great economic advantage(**Fig.4**). For estuary, flow are essentially two-dimensional in character.

The model numerically solves the vertically integrated equations of motion and continuity using the Galerkin finite element method to obtain depth-averaged velocities and flow depths(**Fig.5**). The governing equations account for the effect of bed friction, wind induced stress at the water surface, fluid stresses caused by turbulence, and the effect of Earth's rotation(Detail are available in User's Manual).

The model performs its analysis in three separate, but interrelated modules:

i) The Data Input Module (DINMOD)

ii) The Depth-Averaged Flow Module (FLOMOD)

iii) The Analysis of Output Module (ANOMOD)

The DINMOD generates a two-dimensional finite element network, and acts as a preprocessor of the finite element network data. FLOMOD simulates both steady and unsteady (time-dependent) two-dimensional (in a horizontal plane} surface-water flow. While the ANOMOD stores the results of flow simulations which

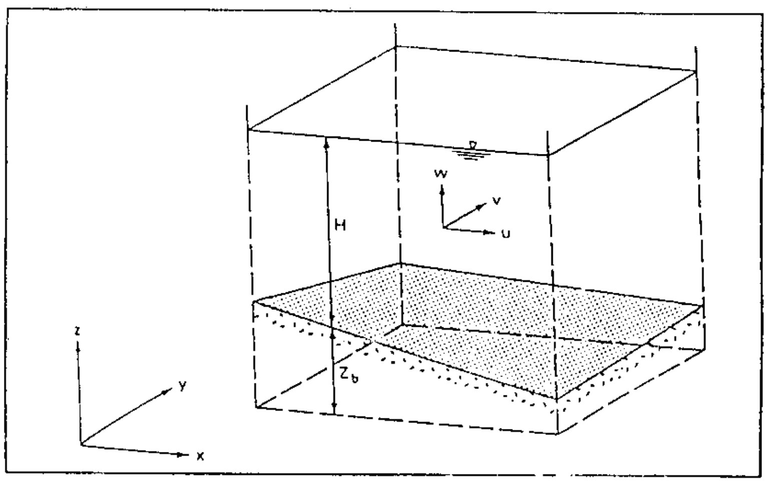

Fig.4: Co-ordinate System and Variables for Flow

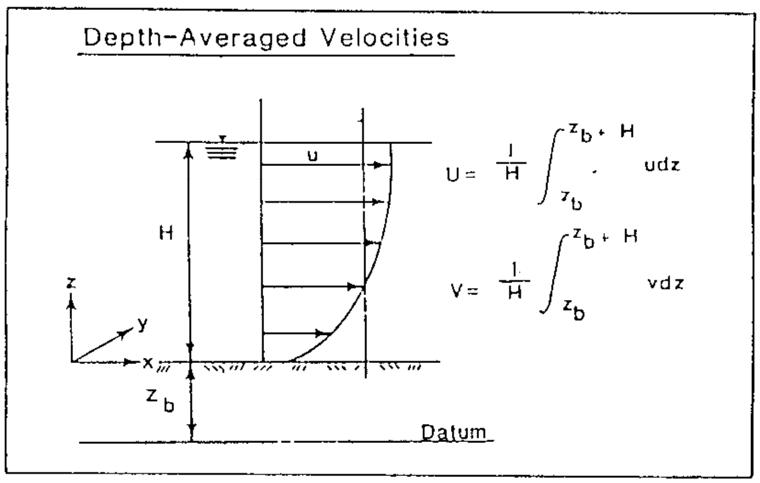

Fig.5: A Map Showing Depth Average Velocity

presents the results graphically. Plots of velocity and unit-flow vectors; ground-surface and water-surface elevation contours; and time-history graphs of velocity, unit flow, or stage (water-surface elevation) at a computation point can be produced. As such the ANOMOD acts as a post-processor in the modelling system.

3.1 Input Data for the Model

Input data can be classified broadly as; i) Program control data; ii) network data, or iii) initial and boundary condition data.

3.1.1 Program control data

Program control data govern the overall operation of the model. These data include codes that define functions to be performed, and constant values that are used as coefficients in equations and apply to the entire finite element network.

3.1.2 Network data

Network data describe the finite element network. These data include element connectivity lists, element property type codes, node point coordinates, and node point ground-surface elevations. Also included as network data are sets of empirical coefficients that apply to a particular element property type.

3.1.3 Initial and boundary condition data

Initial condition data are starting values of the dependent variables and their time derivatives at each node point in the finite element network. Both the water depth and the depth averaged x and y velocity components need to be specified as initial conditions of the problem throughout the entire solution region. Boundary condition data are values of dependent variables that have to be prescribed at particular node points along the boundary of the network. Boundary condition specifications consists of either the normal flux (normal flow) or the normal force (normal stress), in addition to either the tangential mass flux (tangential flow) or the tangential force (Shear stress) at all points on the boundary of a network. The boundary information depends on the types of boundary and the flow condition. Physically, there are two types of boundaries that are encountered in surface-water flow problems; i) a solid, or no flux,boundary; and ii) an open boundary.

3.2 Output from the Model

Output from the modelling system consists of processed network data, computed flow data(depth averaged velocities and water depth at each node point, and the derivatives of these quantities with respect to time for unsteady flow simulations), and plots of both network data and flow data.

4.0 DATA COLLECTION AND METHODOLOGY

4.1 Data Collection

The mechanism of tidal motion is a very complicated phenomenon in view of the variation of the different parameters involved within wide limits during a comparatively short span of time. Moreover, the effect of any local change at any point of the river extends to a great length of the river upto the tidal limits. As such, in planning a project for the closing off river branches in the tidal zone, to reduce pollutant load, to increase availability of sweet water for drinking purpose, etc., it is necessary to investigate the changes in the tidal current including the water levels and the flow velocities which such an alteration is likely to produce in the rivers and creeks. Such a knowledge would reveal the adverse conditions, if any, that may be attained at any point of the river, the levels upto which water may rise under different conditions, the current velocities likely to be obtained in different reaches, etc., so that any corrective measures, if necessary, may be thought of and planned beforehand.

Thus a thorough investigation of the mechanism of tidal motion is required, both for the existing situation as well as for the future, since the departure from the existing conditions would determine the influence of the structure.

For any study on the river behaviour and the tidal movement in the existing situation of the river, however, field observations are necessary as the field data form the basic information on which such studies are based and furnish a good deal of information about the hydraulic and hydrological behaviour of the river.

The investigations about the future conditions after the proposed structure is set up may be made with the help of hydraulic scale models or mathematical models. Either of these methods would need hydrological data of the rivers.

Moreover, these field data are also required for preparing the technical design of the project. As very little field data were available for the rivers and creeks in the West Sundarbans area, elaborate field investigations were carried out during the years 1961-63 in the various rivers and creeks for collecting these data:

1. hydrological survey of the different rivers in the area under consideration including cross sections at regular intervals;
2. discharge measurements in the rivers throughout the tidal cycle including simultaneous velocity observations, current direction measurements and gauge readings.
3. soil explorations including river bed sampling as well as borings from river banks and alignments of enclosure dams for the purpose of determining the foundation criteria and assessment of availability of construction materials.

The cross sectional profiles were taken with the help of echo-sounders at intervals of about 800 metres. An accurate measurement of discharge in a tidal channel is a very difficult and complicated task in view of the rapidly changing discharge parameters. As such the observations were taken with utmost care at a single site only on one date, utilising the available resources of personnel and equipment. Simultaneous velocity observations were taken with current meters at different depths at a number of verticals along the cross section (the number depending upon the width of the cross section). The tide being mainly semi-diurnal, the observations had to be extended over a sufficiently long period so as to cover a full tidal cycle. Velocity observations were, therefore, taken during a 13-hour period continuously of half-hourly intervals. At each site, velocity measurements were repeated under different conditions of tide viz., spring, mean and neap. Simultaneously with each velocity measurement, the direction of the current was also recorded with a current direction meter. Tide gauges were set up at the mouths of the rivers as well as at junctions with the tributaries and branches.

Gauge readings were taken simultaneously with each velocity observation at several gauges in the neighbourhood of the velocity observation site, generally from half an hour before the commencement of the velocity measurement still half an hour after their termination. From these observed data, the discharge was calculated for all observations and the tidal gauge, discharge and velocity curves, etc. were prepared.

The Chezy's coefficient was considered to be 60 for the study area whereas the flow from Storag Lacam's channel, East Saptmukhi and West Saptmukhi gully's were observed as follow:

Table 1: Flow conditions of the study area

Tide/Channel	Saptmukhi East Gully (cumec)	Saptmukhi West Gully (cumec)	Storag Lacam's Channel (cumec)
Neap Tide	8000	3000	3000
Mean Tide	16400	7100	7000
Spring Tide	25000	11200	10300

Table 2: Flow at different nodes of the study area

Node no.	74	107	137	170	332	336	340	354	358	362
Velocity (Neap tide)	.11	.11	.13	.07	.10	.10	.10	.10	.10	.10
Velocity (Spring tide)	0.30	0.32	0.35	.20	.31	.31	.31	.31	.31	.31
Node no.	588	592	596	556	560	564	880	846	852	
Velocity (Neap tide)	.16	.19	.23	.14	.19	.22	.24	.24	.28	
Velocity (Spring tide)	.42	.57	.67	.42	.57	.67	.70	.70	.85	

4.2 Methodology

4.2.1 Networking of the study area

1. As a general rule, model boundaries should be such that where water-surface elevations and flows can be represented accurately. The model boundary, in this case, has been defined considering confluence of the Saptmukhi (East and West

gully) and the Storag Lacam's channel as the upper boundary and sea coast as the lower boundary as shown in **Fig. 6**.

2. The model area has been divided into a number of triangular and quadrangular elements depending on the desired level of details needed for that particular area. Consideration of element size is an important criterion. Smaller the element size better would be the accuracy of computation. The study area thus has been divided into **258** elements. **Annexure I** shows the input data used in DINMOD, FLOMOD and ANOMOD. DINMOD data gives the details of networking & connectivity list.
3. FESWMS-2DH accepts 7-node triangular and 9-node quadrangular elements. The sequencing of node is done from one corner of the element in anti-clockwise direction. The last node of each element is to be the centre node. In this way, all odd nodes are the corner and the centre node. The even nodes are the intermediate nodes. The total number of nodes, for the study area, is **1059**.
4. For each node (excepting the intermediate nodes) the co-ordinates and the bottom elevation were entered(x,y and z) as shown in **Annexure I. Fig.7** illustrates the Ground surface elevation map of the ground surface of the study area as per observed data obtained showing x, y and z coordinates.
5. The Survey data 1963-64 showed that the study area has a gradual downward slope varying from 1:7,000 to 1: 10,000 with ground level elevations varying from 11 metre to 24 metre below mean sea level.

4.2.2 Initial and boundary condition

To obtain solution using FESWMS model, for cold start the water depth at each node is specified at 14.00 meter above ground surface and depth-averaged x

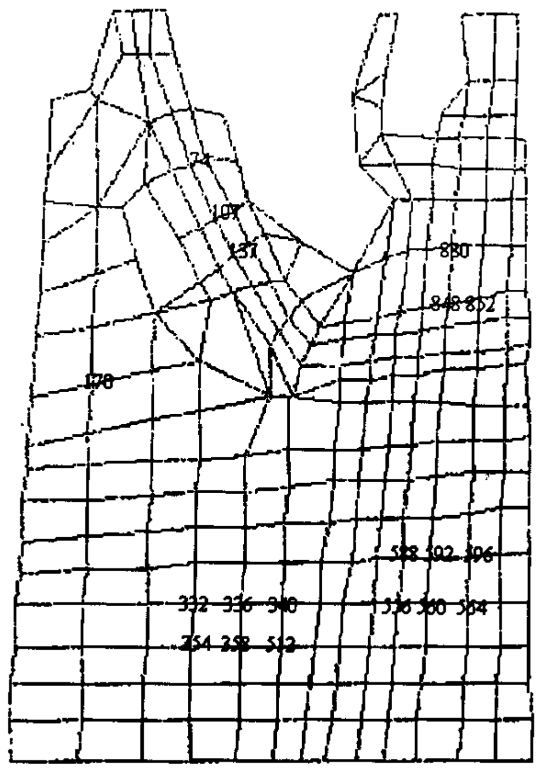

Fig.6: Network Design of the Study Area

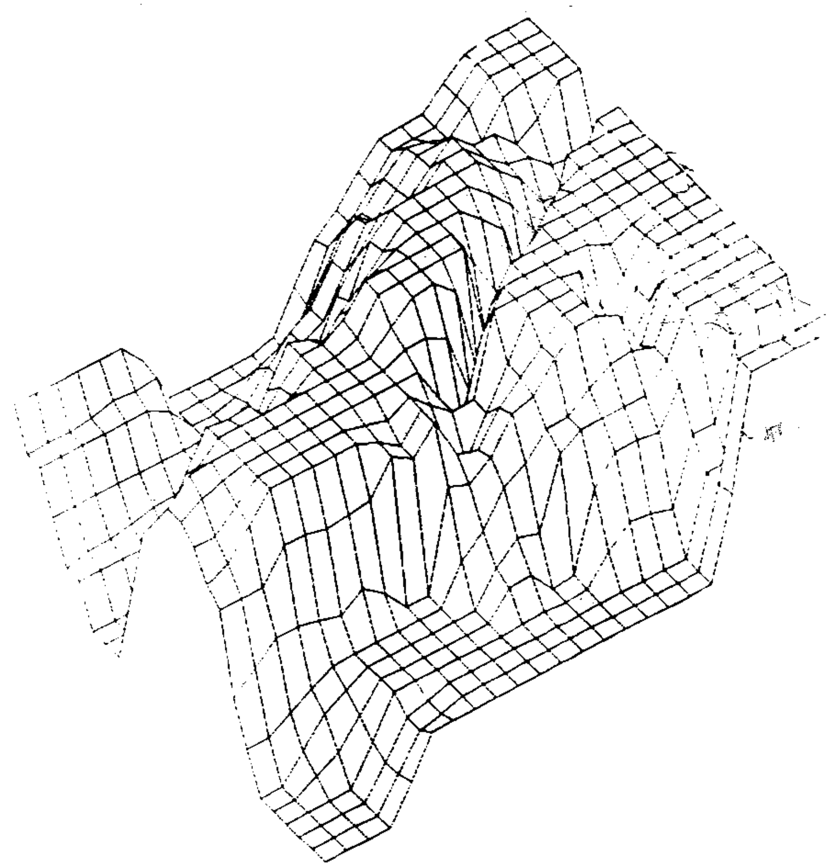

Fig.7: Ground Surface Elevation Map of the Study Area

and y velocity components are set to zero at each node as initial conditions. With these given initial conditions, the model performs a cold-start procedure, and when the results from the run are available, they are replaced as initial conditions for the subsequent runs in the model. The model parameter are also fixed initially with one value and then changed accordingly during calibration of the model. The use of results from previous run as initial conditions is referred to as a hot .

The confluence of the Saptmukhi and Stroag Lacam's channels was considered as upper boundary whereas sea coast water-surface profiles was considered as lower boundary which seems to be stable. Following boundary conditions under different cases have been assumed; i) open boundary, ii) inflow boundary, and iii) outflow boundary.

Selection of eddy viscosity is an important criterion to get the accuracy and stability of the solution. The model accounts for the eddy viscosity concept for computation of depth-averaged stresses caused by turbulence by the Boussinesq's equation. The sensitivity of the eddy viscosity has also been studied.

4.2.3 Application of the model

The modelling system(FESWMS-2DH) was then used for processing of network data, computation of flow data(depth averaged velocities and water depth at each node point, and the derivatives of these quantities with respect to time for unsteady flow simulations), and plotting of both network data and flow data.

5.0 RESULTS AND DISCUSSION

The results have been obtained using FESWMS model with different flow conditions as given below:

1. To study the effect of flow from estuaries(normal and peak flow) following cases have been tried: (a) flow from Storag Lacam's Channel with no effect of tides, (b) flow from Saptmukhi east gully with no effect of tides, (c) flow from Saptmukhi west gully with no effect of tides, (d) flow from all the channels with no effect of tides.
2. To study the effect of flow with tides in the study area the following cases have been tried: (e) Flow from all the channels with effect of neap tides, and (f) Flow from all the channels with effect of Spring tides.

The results obtained for different flow conditions are :

5.1 Effect of Flow from River Estuaries

5.1.1 Flow from Storag Lacam's Channel with no effect of tides

In this case it was considered that the Saptmukhi east and west gullies are closed(no flow) and the flow is only from Storag Lacam's channel. No tidal affect at the outflow boundary has been considered in the analysis.

It was observed by the model that the flow(normal and peak) from the Storag Lacam's channel does not affect the Saptmukhi closure as well as other areas. It affects only adjacent areas of the Storag Lacam's channel(**Fig.8**). As the flow proceeds further from the inflow boundary, the energy dissipates quickly because of low flow in the large water spread area the closures of Saptmukhi river estuaries

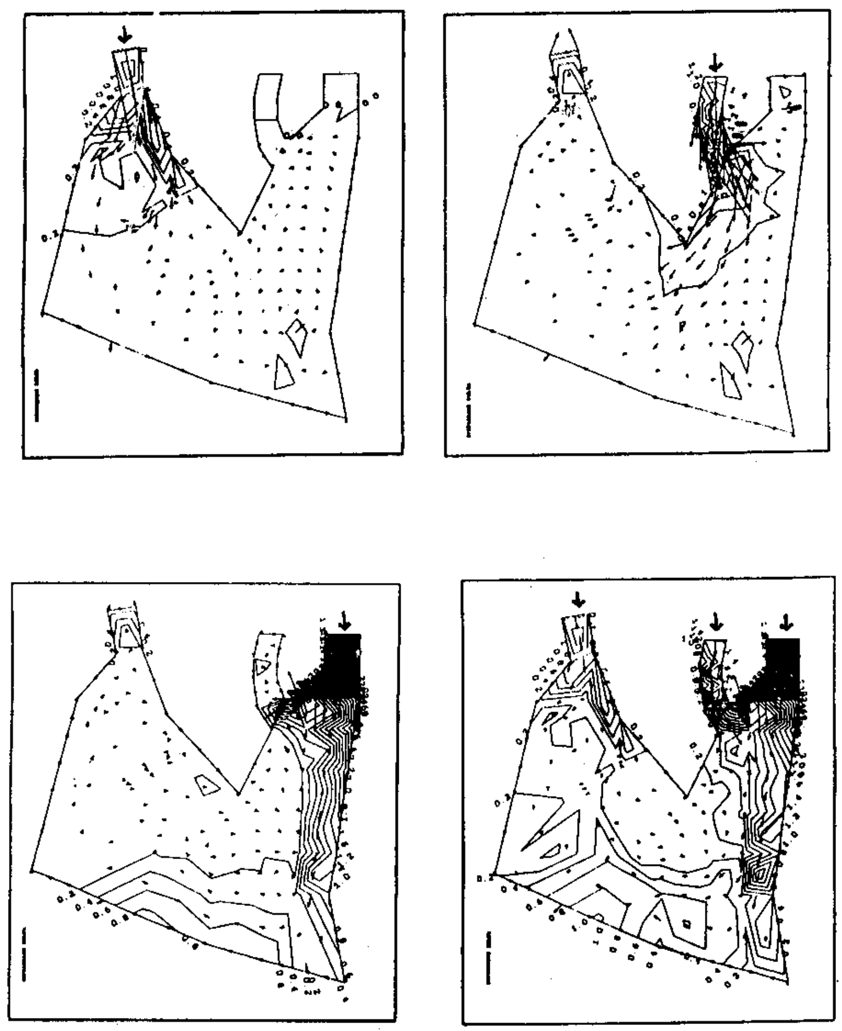

Fig.8:Computed flow Velocities for different boundary conditions

does not get affected by the flow from Storag Lacam's channel. No observed data were available for this case to compare with the computed results.

5.1.2 Flow from Saptmukhi east gully with no effect of tides

In this case it was considered that the Saptmukhi west gully and Storag Lacam's channel are closed(no flow) and the flow is only from Saptmukhi east gully. No tidal affect at the outflow boundary has been considered in the analysis.

The results obtained by the model are similar to the previous result and the flow(normal and peak) from the Saptmukhi east gully does not affect the Storag Lacam's channel, Saptmukhi west gully & other areas. It affects only adjacent areas of the Storag Lacam's channel (**Fig.8**). No observed data were available for this case to compare with the computed results.

5.1.3 Flow from Saptmukhi west gully with no effect of tides

In this case it was considered that the Saptmukhi east gully and Storag Lacam's channel are closed(no flow) and the flow is only from Saptmukhi west gully. No tidal affect at the outflow boundary has been considered in the analysis.

The results obtained by the model shows that due to high magnitude of inflow from the Saptmukhi west gully, the Saptmukhi east gully and Storag Lacam's channel are affected. The energy dissipates in the direction of outflow boundary and Storag Lacam's channel(**Fig.8**). The phenomena of secondary circulation and affect of curvature in flow phenomena can be visualised in the diagram. No observed data were available for this case to compare with the computed results.

5.1.4 Flow from All River estuaries with no effect of tides

In this case, the flow(normal and peak flow) was considered from all the river estuaries i.e. the Saptmukhi east gully, Saptmukhi west gully and Storag Lacam's channel , with no tidal affect at the outflow.

With the flow from all the three channel, the hydrodynamic conditions of the study area drastically changes and high degree of turbulence occurs. In the FESWMS model, for peak flow from all the three channel simultaneously several models runs and iterations have been tried to converge the governing equations and obtain the solution(**Fig.8**). It was observed that the flow turbulence is higher at the confluence of Saptmukhi east and west gully and reduces further downstream. The turbulence was observed to be minimum at the outflow boundary in the sea.

5.2 Effect of Flow and Tides from River Estuaries

5.2.1 Flow from All River estuaries with effect of Neap tides

In this case, the flow(normal and peak flow) was considered from all the river estuaries i.e. the Saptmukhi east gully, Saptmukhi west gully and Storag Lacam's channel , with neap tides at the outflow boundary.

Due to flow from all the three channels and neaps tides at the outflow boundary, more complex flow condition occurs and require more model runs and iterations to obtain the solution. **Fig.9** illustrates the flux variation at different location(node points) of the study area. It shows higher flux of 7593 m^3/s near confluence of Saptmukhi east and west gullies and minimum of 444 m^3/s near Storag Lacam's Channel.

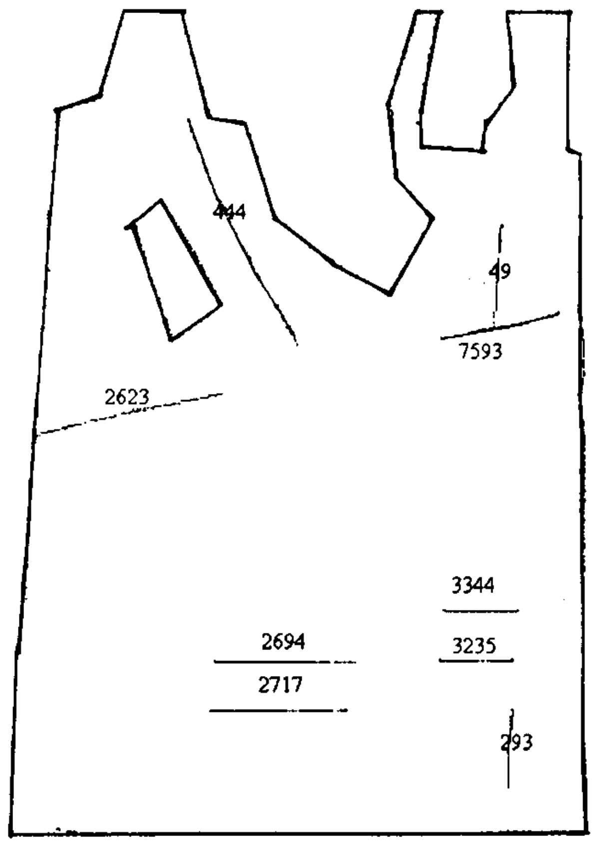

Fig.9: Computed Flux at Various Locations for Neap Tides

With the FESWMS model the flow velocity, unit flow and water surface elevations were computed at each node point. The results of some node points for which observed data are available are given in **Table 3(Annexure II)**.

Fig.10 illustrates the comparison of observed flow velocity with computed ones(computed mean and computed maximum flow velocities). The result computed by the model indicates that the mean computed flow velocity have good approximation with the observed flow values whereas the computed maximum flow velocity shows higher values.

The eddy viscosity is a very sensitive parameter and needs to be computed very carefully. In the present study, different values of eddy viscosity has been used to calibrate the model. **Table 4(Annexure II)** illustrates the results obtained using different eddy viscosity values. As the effect of eddy viscosity is not high, the e.e.=100 m^2/s has been considered in the present study.

5.2.2 Flow from All River estuaries with effect of Spring tides

In this case, the flow(normal and peak flow) was considered from all the river estuaries i.e. the Saptmukhi east gully, Saptmukhi west gully and Storag Lacam's channel , with spring tides at the outflow boundary.

As similar to previous case, due to flow from all the three channels and spring tides at the outflow boundary, highly complex flow condition occurs and require more model runs and iterations to obtain the solution. **Fig.11** illustrates the flux variation at different location(node points) of the study area. It shows higher flux of 26101 m^3/s near confluence of Saptmukhi east and west gullies and minimum of 458 m^3/s near Storag Lacam's Channel. The results obtained are close to the observed data as shown in **Fig.3**.

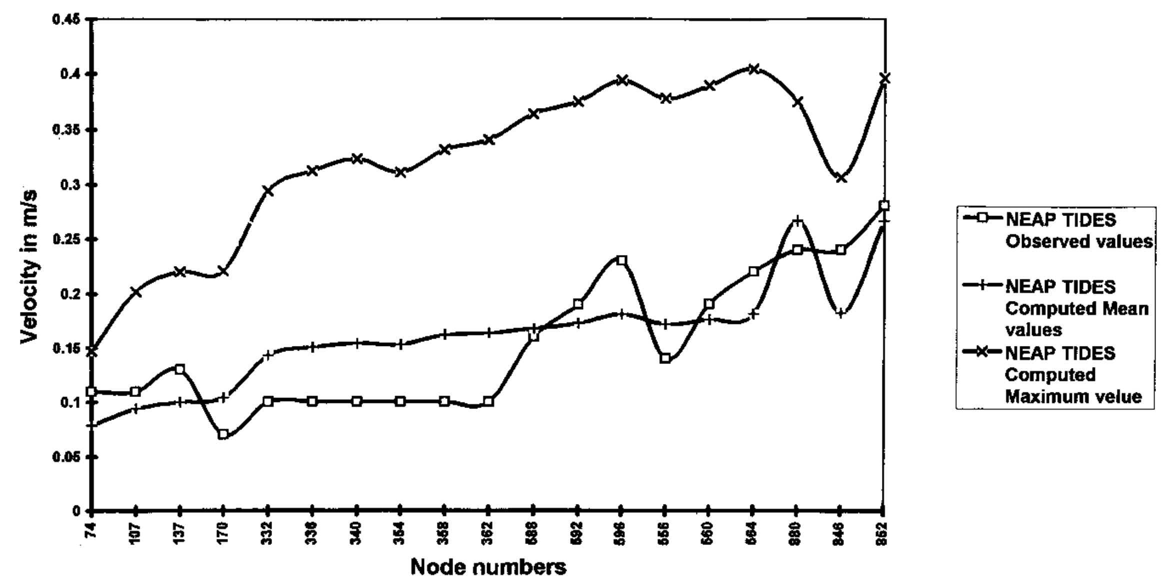

Fig.10: Comparison of Observed Vs Computed values(Neap tides)

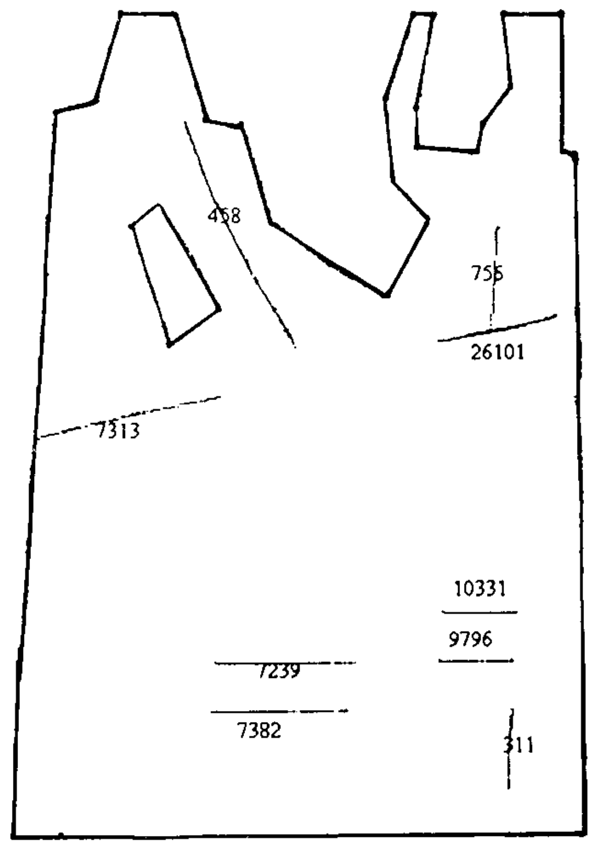

Fig.11: Computed Flux at Various Locations for Spring Tides

The flow velocity, unit flow and water surface elevations were computed by the model at each node point. The results of some node points for which observed data are available are given in **Table 5(Annexure II)**.

Fig.12 illustrates the comparison of observed flow velocity with computed ones(computed mean and computed maximum flow velocities). The result computed by the model indicates that the mean computed flow velocity have good approximation with the observed values from node number 362 onwards i.e. in the region of Saptmukhi east and west gullies. For the node numbers from 74 to 362 i.e. in the region of Storag Lacam's channel, the computed mean flow values are slightly lower than the observed flow values. The computed maximum flow also has good approximation with the observed flow values.

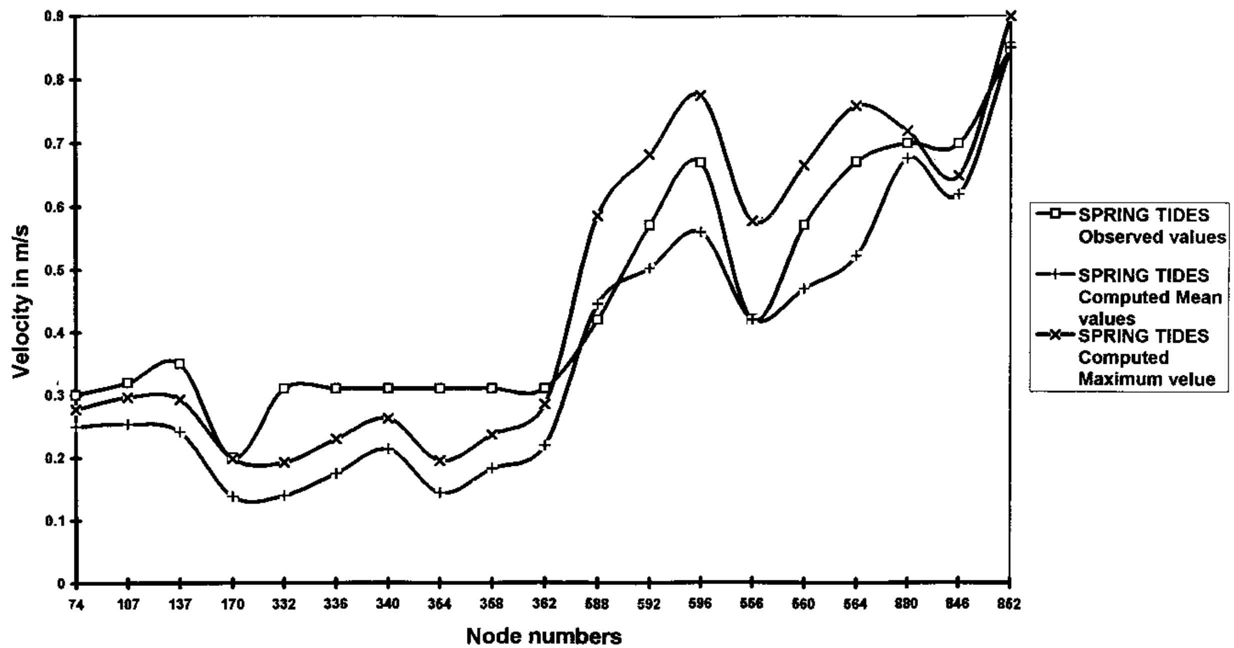

Fig.12: Comparison of observed Vs Computed values(Spring tides)

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ANNEXURE I

```
TIME

SWMS                 1          1
NETWORK DESIGN OF THE STUDY AREA-DIMNOD
   0    3    1    0    0    1    0    1
PLOT

    1    0
       .000       .200       .200       .200       1.0
       .000       .000       .000       .000  1500.000  1500.000        .000
ELEM
    1    1    2    3    4    5    6    7    8    9    0    0
    2    7    6    5   10   11   12   13   14   15    1    0
    3    7   14   13   16   17   18   19   20   21    1    0
    4   19   18   17   22   23   24   25   26   27    1    0
    5   25   24   23   28   29   30   31   32   33    1    0
    6   31   30   29   34   35   36    0    0    0    0    0
    7    3   37   38   39   11   10    5    4   40    1    0
    8   13   12   11   41   42   43   17   16   44    1    0
    9   17   43   42   45   46   47   23   22   48    1    0
   10   23   47   46   49   50   51   29   28   52    1    0
   11   29   51   50   53   54   55   35   34   56    0    0
   12   38   57   58   59   60   61   11   39   62    1    0
   13   11   61   60   63   42   41    0    0    0    1    0
   14   42   63   60   64   65   66   67   68   69    1    0
   15   42   68   67   70   71   72    0    0    0    1    0
   16   42   72   71   73   74   75   46   45   76    1    0
   17   46   75   74   77   78   79   50   49   80    1    0
   18   50   79   78   81   82   83   54   53   84    1    0
   19   58   85   86   87   60   59    0    0    0    1    0
   20   86   88   89   90   91   92   60   87   93    1    0
   21   60   92   91   94   95   96   65   64   97    1    0
   22   65   96   95   98   99  100   67   66  101    0    0
   23   67  100   99  102  103  104   71   70  105    1    0
   24   71  104  103  106  107  108   74   73  109    1    0
   25   74  108  107  110  111  112   78   77  113    1    0
   26   78  112  111  114  115  116   82   81  117    1    0
   27   89  118  119  120  121  122   91   90  123    1    0
   28   91  122  121  124  125  126   95   94  127    1    0
   29   95  126  125  128  129  130   99   98  131    0    0
   30   99  130  129  132  133  134  103  102  135    1    0
   31  103  134  133  136  137  138  107  106  139    1    0
   32  107  138  137  140  141  142  111  110  143    1    0
   33  111  142  141  144  145  146  115  114  147    1    0
   34  125  148  149  150  129  128    0    0    0    1    0
   35  129  150  149  151  152  153  133  132  154    1    0
   36  133  153  152  155  156  157  137  136  158    1    0
   37  137  157  156  159  160  161  141  140  162    1    0
   38  141  161  160  163  164  165  145  144  166    1    0
   39  119  167  168  169  170  171  121  120  172    1    0
   40  121  171  170  173  174  175  125  124  176    1    0
   41  125  175  174  177  178  179    0    0    0    1    0
   42  125  179  178  180  149  148    0    0    0    1    0
   43  149  180  178  181  182  183  152  151  184    1    0
   44  152  183  182  185  186  187    0    0    0    1    0
   45  152  187  186  188  189  190  156  155  191    1    0
   46  156  190  189  192  193  194  160  159  195    1    0
   47  160  194  193  196  197  198  164  163  199    1    0
   48  168  200  201  202  203  204  170  169  205    1    0
   49  170  204  203  206  207  208  174  173  209    1    0
   50  174  208  207  210  211  212  178  177  213    1    1
   51  178  212  211  214  182  181    0    0    0    1    0
   52  186  185  182  215  216  217  218  219  220    1    0
```

53	186	219	218	221	222	223	189	188	224	1	0
54	189	223	222	225	226	227	193	192	228	1	0
55	193	227	226	229	230	231	197	196	232	1	0
56	201	233	234	235	236	237	203	202	238	1	0
57	203	237	236	239	240	241	207	206	242	1	0
58	207	241	240	243	244	245	211	210	246	1	0
59	211	245	244	247	248	249	182	214	250	1	0
60	182	249	248	251	252	253	216	215	254	1	0
61	234	255	256	257	258	259	236	235	260	1	0
62	236	259	258	261	262	263	240	239	264	1	0
63	240	263	262	265	266	267	244	243	268	1	0
64	244	267	266	269	270	271	248	247	272	1	0
65	248	271	270	273	274	275	252	251	276	1	0
66	256	277	278	279	280	281	258	257	282	1	0
67	258	281	280	283	284	285	262	261	286	1	0
68	262	285	284	287	288	289	266	265	290	1	0
69	266	289	288	291	292	293	270	269	294	1	0
70	270	293	292	295	296	297	274	273	298	1	0
71	278	299	300	301	302	303	280	279	304	1	0
72	280	303	302	305	306	307	284	283	308	1	0
73	284	307	306	309	310	311	288	287	312	1	0
74	288	311	310	313	314	315	292	291	316	1	0
75	292	315	314	317	318	319	296	295	320	1	0
76	300	321	322	323	324	325	302	301	326	1	0
77	302	325	324	327	328	329	306	305	330	1	0
78	306	329	328	331	332	333	310	309	334	1	0
79	310	333	332	335	336	337	314	313	338	1	0
80	314	337	336	339	340	341	318	317	342	1	0
81	322	343	344	345	346	347	324	323	348	1	0
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83	328	351	350	353	354	355	332	331	356	1	0
84	332	355	354	357	358	359	336	335	360	1	0
85	336	359	358	361	362	363	340	339	364	1	0
86	344	365	366	367	368	369	346	345	370	1	0
87	346	369	368	371	372	373	350	349	374	1	0
88	350	373	372	375	376	377	354	353	378	1	0
89	354	377	376	379	380	381	358	357	382	1	0
90	358	381	380	383	384	385	362	361	386	1	0
91	366	387	388	389	390	391	368	367	392	1	0
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93	372	395	394	397	398	399	376	375	400	1	0
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98	394	417	416	419	420	421	398	397	422	1	0
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116	504	503	470	477	476	507	508	509	510	1	0

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133	318	341	340	545	544	575	576	577	578	1	0
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137	588	587	556	561	560	591	592	593	594	1	0
138	592	591	560	565	564	595	596	597	598	1	0
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140	600	599	568	573	572	603	604	605	606	1	0
141	296	319	318	577	576	607	608	609	610	1	0
142	608	607	576	581	580	611	612	613	614	1	0
143	612	611	580	585	584	615	616	617	618	1	0
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146	624	623	592	597	596	627	628	629	630	1	0
147	628	627	596	601	600	631	632	633	634	1	0
148	632	631	600	605	604	635	636	637	638	1	0
149	274	297	296	609	608	639	640	641	642	1	0
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151	644	643	612	617	616	647	648	649	650	1	0
152	648	647	616	621	620	651	652	653	654	1	0
153	652	651	620	625	624	655	656	657	658	1	0
154	656	655	624	629	628	659	660	661	662	1	0
155	660	659	628	633	632	663	664	665	666	1	0
156	664	663	632	637	636	667	668	669	670	1	0
157	252	275	274	641	640	671	672	673	674	1	0
158	672	671	640	645	644	675	676	677	678	1	0
159	676	675	644	649	648	679	680	681	682	1	0
160	680	679	648	653	652	683	684	685	686	1	0
161	684	683	652	657	656	687	688	689	690	1	0
162	688	687	656	661	660	691	692	693	694	1	0
163	692	691	660	665	664	695	696	697	698	1	0
164	696	695	664	669	668	699	700	701	702	1	0
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166	704	703	672	677	676	707	708	709	710	1	0
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169	716	715	684	689	688	719	720	721	722	1	0
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171	724	723	692	697	696	727	728	729	730	1	0
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176	744	743	712	717	716	747	748	749	750	1	0
177	748	747	716	721	720	751	752	753	754	1	0
178	752	751	720	725	724	755	756	757	758	1	0
179	756	755	724	729	728	759	760	761	762	1	0
180	760	759	728	733	732	763	764	765	766	1	0

181	222	221	218	737	736	767	768	769	770	1	0
182	768	767	736	741	740	771	772	773	774	1	0
183	772	771	740	745	744	775	776	777	778	1	0
184	776	775	744	749	748	779	780	781	782	1	0
185	780	779	748	753	752	783	784	785	786	1	0
186	784	783	752	757	756	787	788	789	790	1	0
187	788	787	756	761	760	791	792	793	794	1	0
188	792	791	760	765	764	795	796	797	798	1	0
189	226	225	222	769	768	799	800	801	802	1	0
190	800	799	768	773	772	803	804	805	806	1	0
191	804	803	772	777	776	807	808	809	810	1	0
192	808	807	776	781	780	811	812	813	814	1	0
193	812	811	780	785	784	815	816	817	818	1	0
194	816	815	784	789	788	819	820	821	822	1	0
195	820	819	788	793	792	823	824	825	826	1	0
196	824	823	792	797	796	827	828	829	830	1	0
197	230	229	226	801	800	831	832	833	834	1	0
198	832	831	800	805	804	835	836	837	838	1	0
199	836	835	804	809	808	839	840	841	842	1	0
200	840	839	808	813	812	843	844	845	846	1	0
201	844	843	812	817	816	847	848	849	850	1	0
202	848	847	816	821	820	851	852	853	854	1	0
203	852	851	820	825	824	855	856	857	858	1	0
204	856	855	824	829	828	859	860	861	862	1	0
205	197	231	230	863	864	865	0	0	0	1	0
206	864	863	230	833	832	866	0	0	0	1	0
207	864	866	832	837	836	867	868	869	870	1	0
208	868	867	836	841	840	871	872	873	874	1	0
209	872	871	840	845	844	875	876	877	878	1	0
210	876	875	844	849	848	879	880	881	882	1	0
211	880	879	848	853	852	883	884	885	886	1	0
212	884	883	852	857	856	887	888	889	890	1	0
213	888	887	856	861	860	891	892	893	894	1	0
214	164	198	197	865	864	895	896	897	898	1	0
215	896	895	864	899	900	901	902	903	904	0	0
216	900	899	864	869	868	905	0	0	0	1	0
217	900	905	868	873	872	906	907	908	909	1	0
218	907	906	872	877	876	910	911	912	913	1	0
219	911	910	876	881	880	914	915	916	917	1	0
220	915	914	880	885	884	918	919	920	921	1	0
221	919	918	884	889	888	922	923	924	925	1	0
222	923	922	888	893	892	926	927	928	929	1	0
223	145	165	164	897	896	930	0	0	0	1	0
224	115	146	145	930	896	931	0	0	0	1	0
225	115	931	896	903	902	932	933	934	935	0	0
226	902	901	900	908	907	936	937	938	939	1	0
227	937	936	907	912	911	940	941	942	943	1	0
228	941	940	911	916	915	944	945	946	947	1	0
229	945	944	915	920	919	948	949	950	951	1	0
230	949	948	919	924	923	952	953	954	955	1	0
231	953	952	923	928	927	956	957	958	959	1	0
232	902	938	937	960	961	962	0	0	0	1	0
233	961	960	937	942	941	963	964	965	966	1	0
234	964	963	941	946	945	967	968	969	970	1	0
235	968	967	945	950	949	971	972	973	974	1	0
236	972	971	949	954	953	975	976	977	978	1	0
237	976	975	953	958	957	979	980	981	982	1	0
238	933	932	902	962	961	983	984	985	986	1	0
239	984	983	961	965	964	987	988	989	990	0	0
240	988	987	964	969	968	991	992	993	994	1	0
241	992	991	968	973	972	995	996	997	998	1	0
242	996	995	972	977	976	999	1000	1001	1002	1	0
243	1000	999	976	981	980	1003	1004	1005	1006	0	0
244	933	985	984	1007	1008	1009	0	0	0	1	0

245	1008	1007	984	989	988	1010	1011	1012	1013	0	0
246	1011	1010	988	993	992	1014	0	0	0	1	0
247	1011	1014	992	997	996	1015	1016	1017	1018	1	0
248	1016	1015	996	1001	1000	1019	1020	1021	1022	1	0
249	1020	1019	1000	1005	1004	1023	1024	1025	1026	0	0
250	82	116	115	934	933	1027	1028	1029	1030	0	0
251	1028	1027	933	1009	1008	1031	1032	1033	1034	1	0
252	1032	1031	1008	1012	1011	1035	1036	1037	1038	0	0
253	1036	1035	1011	1017	1016	1039	1040	1041	1042	1	0
254	1040	1039	1016	1021	1020	1043	1044	1045	1046	1	0
255	1044	1043	1020	1025	1024	1047	1048	1049	1050	0	0
256	54	83	82	1029	1028	1051	1052	1053	1054	0	0
257	35	55	54	1053	1052	1055	1056	1057	1058	0	0
258	31	36	35	1057	1056	1059	0	0	0	0	0

NODE		1500.000	1500.000	1.000	.000	.000	.000
	1	1.200	16.800	40.000	.000		
	3	1.000	14.800	40.000	.000		
	5	2.000	15.000	40.000	.000		
	7	2.600	16.800	40.000	.000		
	11	2.200	14.800	39.000	.000		
	13	2.900	15.800	39.000	.000		
	17	3.300	15.800	37.180	.000		
	19	3.100	16.800	37.180	.000		
	23	3.600	15.800	39.000	.000		
	25	3.600	16.800	39.000	.000		
	29	4.300	15.800	40.000	.000		
	31	4.000	16.800	40.000	.000		
	35	4.700	15.800	40.000	.000		
	38	.900	13.200	39.000	.000		
	42	3.600	14.300	39.000	.000		
	46	4.200	14.500	37.180	.000		
	50	4.700	14.600	40.000	.000		
	54	5.600	14.400	40.000	.000		
	58	.800	12.500	39.000	.000		
	60	2.200	12.400	40.000	.000		
	65	2.900	12.400	40.000	.000		
	67	3.500	12.900	40.000	.000		
	71	4.200	13.200	39.000	.000		
	74	4.700	13.300	37.180	.000		
	78	5.100	13.500	39.000	.000		
	82	6.000	13.400	40.000	.000		
	86	.800	11.600	39.000	.000		
	89	.700	10.500	37.800	.000		
	91	2.200	10.900	39.000	.000		
	95	3.300	11.200	40.000	.000		
	99	4.400	11.700	40.000	.000		
	103	5.000	11.900	39.000	.000		
	107	5.400	12.100	37.180	.000		
	111	5.900	12.300	39.000	.000		
	115	6.300	12.500	40.000	.000		
	119	.600	9.500	37.180	.000		
	121	2.100	9.700	39.000	.000		
	125	3.800	10.000	40.000	.000		
	129	5.000	10.700	40.000	.000		
	133	5.500	11.000	39.000	.000		
	137	5.900	11.300	37.180	.000		
	141	6.300	11.600	39.000	.000		
	145	6.700	11.800	40.000	.000		
	149	5.300	10.300	40.000	.000		
	152	5.900	10.500	40.000	.000		
	156	6.400	10.600	37.180	.000		
	160	6.900	10.700	39.000	.000		
	164	7.300	10.700	40.000	.000		

168	.500	8.100	35.360	.000
170	2.100	8.400	37.180	.000
174	3.700	8.700	39.000	.000
178	5.000	8.900	40.000	.000
182	6.900	8.100	40.000	.000
186	6.900	9.300	39.000	.000
189	7.100	9.600	37.180	.000
193	7.400	9.900	39.000	.000
197	7.700	10.300	40.000	.000
201	.400	7.000	35.360	.000
203	2.000	7.300	36.580	.000
207	3.700	7.600	37.180	.000
211	5.000	7.800	40.000	.000
216	7.400	8.100	39.000	.000
218	7.500	8.100	39.000	.000
222	7.700	8.800	37.180	.000
226	8.000	9.300	39.000	.000
230	8.200	9.700	40.000	.000
234	.400	6.500	35.360	.000
236	2.000	6.600	35.970	.000
240	3.700	6.700	36.580	.000
244	5.000	6.700	39.000	.000
248	6.200	6.800	39.000	.000
252	7.400	6.900	39.000	.000
256	.300	5.800	35.360	.000
258	2.000	5.800	35.360	.000
262	3.700	5.900	35.360	.000
266	4.900	6.000	39.000	.000
270	6.200	6.000	39.000	.000
274	7.400	6.100	39.000	.000
278	.300	4.900	35.360	.000
280	2.000	5.000	35.360	.000
284	3.600	5.100	35.360	.000
288	4.900	5.200	39.000	.000
292	6.200	5.200	39.000	.000
296	7.300	5.300	39.000	.000
300	.200	4.200	36.580	.000
302	2.000	4.300	35.360	.000
306	3.600	4.300	33.530	.000
310	4.900	4.400	37.180	.000
314	6.200	4.400	39.000	.000
318	7.300	4.400	39.000	.000
322	.100	3.500	37.180	.000
324	1.900	3.500	35.360	.000
328	3.600	3.500	33.530	.000
332	4.900	3.500	37.180	.000
336	6.100	3.500	39.000	.000
340	7.200	3.500	39.000	.000
344	.100	2.500	37.180	.000
346	1.900	2.500	35.360	.000
350	3.600	2.500	33.530	.000
354	4.800	2.500	35.360	.000
358	6.100	2.500	39.000	.000
362	7.200	2.500	39.000	.000
366	.000	1.700	37.180	.000
368	1.900	1.700	35.360	.000
372	3.500	1.700	33.530	.000
376	4.800	1.700	35.360	.000
380	6.100	1.700	39.000	.000
384	7.100	1.700	39.000	.000
388	.000	.900	37.180	.000
390	1.900	.900	35.360	.000
394	3.500	.900	33.530	.000
398	4.800	.900	33.530	.000

402	6.100	.900	37.180	.000
406	7.100	.900	39.000	.000
410	.000	.000	37.180	.000
412	1.800	.000	35.360	.000
416	3.500	.000	33.530	.000
420	4.800	.000	33.530	.000
424	6.000	.000	37.180	.000
428	7.000	.000	38.400	.000
432	7.800	.000	38.400	.000
434	7.900	.900	38.400	.000
438	8.400	.000	37.800	.000
440	8.600	.900	37.800	.000
444	9.300	.000	37.180	.000
446	9.400	.900	37.180	.000
450	10.000	.000	35.360	.000
452	10.100	.900	35.360	.000
456	10.900	.000	33.530	.000
458	10.900	.900	33.530	.000
462	12.000	.000	33.530	.000
464	12.100	.900	33.530	.000
468	13.000	.000	33.530	.000
470	13.000	.900	33.530	.000
474	14.000	.000	33.530	.000
476	14.000	.900	33.530	.000
480	8.000	1.700	39.000	.000
484	8.700	1.700	39.000	.000
488	9.500	1.700	37.180	.000
492	10.200	1.700	35.360	.000
496	11.000	1.700	34.750	.000
500	12.100	1.700	33.530	.000
504	13.000	1.700	33.530	.000
508	13.900	1.700	33.530	.000
512	8.100	2.500	39.000	.000
516	8.800	2.500	39.000	.000
520	9.600	2.500	37.180	.000
524	10.300	2.500	35.360	.000
528	11.100	2.500	34.750	.000
532	12.200	2.500	33.530	.000
536	13.100	2.500	33.530	.000
540	13.900	2.500	33.530	.000
544	8.300	3.500	39.000	.000
548	8.900	3.500	39.000	.000
552	9.700	3.500	36.580	.000
556	10.400	3.500	35.360	.000
560	11.100	3.500	35.360	.000
564	12.200	3.500	35.360	.000
568	13.100	3.500	34.750	.000
572	13.900	3.500	35.360	.000
576	8.300	4.400	39.000	.000
580	9.100	4.400	39.000	.000
584	9.800	4.500	36.580	.000
588	10.500	4.500	35.360	.000
592	11.200	4.500	35.360	.000
596	12.300	4.500	35.360	.000
600	13.100	4.600	35.360	.000
604	13.900	4.600	35.360	.000
608	8.500	5.300	39.000	.000
612	9.200	5.400	39.000	.000
616	9.900	5.400	35.360	.000
620	10.500	5.400	35.360	.000
624	11.300	5.400	35.360	.000
628	12.300	5.500	35.360	.000
632	13.100	5.600	35.360	.000
636	13.900	5.600	35.360	.000

640	8.600	6.200	38.400	.000
644	9.300	6.200	38.400	.000
648	10.000	6.200	35.360	.000
652	10.600	6.200	35.360	.000
656	11.400	6.300	35.360	.000
660	12.400	6.400	35.360	.000
664	13.200	6.400	35.360	.000
668	13.900	6.400	35.360	.000
672	8.600	6.900	39.000	.000
676	9.400	6.900	39.000	.000
680	10.100	7.000	37.180	.000
684	10.700	7.000	35.360	.000
688	11.400	7.100	35.360	.000
692	12.400	7.100	35.360	.000
696	13.200	7.100	35.360	.000
700	13.900	7.200	35.360	.000
704	8.800	8.000	37.180	.000
708	9.500	8.000	37.180	.000
712	10.200	8.000	37.180	.000
716	10.800	8.000	37.180	.000
720	11.500	8.000	36.580	.000
724	12.400	7.900	35.360	.000
728	13.200	7.900	35.360	.000
732	13.900	7.900	35.360	.000
736	8.800	8.500	37.180	.000
740	9.600	8.500	38.400	.000
744	10.200	8.600	38.400	.000
748	10.900	8.600	37.180	.000
752	11.600	8.700	35.360	.000
756	12.500	8.700	35.360	.000
760	13.300	8.800	35.360	.000
764	13.800	8.800	35.360	.000
768	8.800	8.800	37.180	.000
772	9.600	8.900	39.000	.000
776	10.300	9.000	38.400	.000
780	10.900	9.000	37.180	.000
784	11.600	9.100	35.360	.000
788	12.500	9.100	35.360	.000
792	13.300	9.200	35.360	.000
796	13.900	9.300	35.360	.000
800	8.900	9.400	39.000	.000
804	9.700	9.500	39.000	.000
808	10.300	9.500	38.400	.000
812	11.000	9.600	37.800	.000
816	11.600	9.700	35.360	.000
820	12.500	9.800	35.360	.000
824	13.300	9.900	35.360	.000
828	13.900	9.900	35.360	.000
832	8.900	9.800	39.000	.000
836	9.800	9.900	39.000	.000
840	10.400	10.000	38.400	.000
844	11.000	10.100	38.400	.000
848	11.700	10.200	37.180	.000
852	12.500	10.300	35.360	.000
856	13.300	10.500	35.360	.000
860	13.800	10.500	35.360	.000
864	9.100	10.900	40.000	.000
868	10.000	11.200	40.000	.000
872	10.600	11.400	38.400	.000
876	11.100	11.400	38.400	.000
880	11.800	11.500	37.800	.000
884	12.600	11.500	35.360	.000
888	13.400	11.500	35.360	.000
892	13.800	11.500	35.360	.000

896	7.700	11.600	40.000	.000
900	10.200	12.500	40.000	.000
902	9.300	13.300	38.400	.000
907	10.700	12.500	38.400	.000
911	11.300	12.500	38.400	.000
915	11.900	12.500	37.180	.000
919	12.700	12.500	35.360	.000
923	13.400	12.500	35.360	.000
927	13.800	12.500	35.360	.000
933	9.100	14.900	40.000	.000
937	10.300	13.300	39.000	.000
941	11.300	13.300	39.000	.000
945	12.000	13.200	38.400	.000
949	12.700	13.200	37.180	.000
953	13.500	13.200	37.180	.000
957	13.800	13.200	37.180	.000
961	9.900	14.000	40.000	.000
964	11.400	13.900	40.000	.000
968	12.000	13.900	38.400	.000
972	12.700	13.900	37.180	.000
976	13.500	13.900	40.000	.000
980	13.800	13.800	40.000	.000
984	9.900	14.600	40.000	.000
988	11.500	14.400	40.000	.000
992	12.100	14.400	39.000	.000
996	12.800	14.400	37.180	.000
1000	13.500	14.400	40.000	.000
1004	13.800	14.400	40.000	.000
1008	10.000	15.400	40.000	.000
1011	12.200	15.200	40.000	.000
1016	12.900	15.200	37.180	.000
1020	13.500	15.200	40.000	.000
1024	13.800	15.100	40.000	.000
1028	9.800	16.700	40.000	.000
1032	10.300	16.700	40.000	.000
1036	12.000	16.700	40.000	.000
1040	12.900	16.700	37.180	.000
1044	13.500	16.700	40.000	.000
1048	13.800	16.700	40.000	.000
1052	8.500	16.700	40.000	.000
1056	7.000	16.700	40.000	.000

```
RESE
   1  100
 207  210  211   -1
   1  100
  19   26   25   -1

LAST
```

```
SWMS                1          1
NEAP TIDAL FLOW
    0    0    1    1    1    0    0    2    0    0    1
    1    1    1    1    0    0   98   99
         0         15          0       1400      1.000     13.000      1.000      1.000
      .000       .000      1.937      1.000       .000   .990E+02       .500       .500
      .100     10.000   .123E+01      1.000       .050       .000      .0000
PROP
         1      .0000      .0000      .0000      .0000    60.0000    400E+02      .0000

FLUX
   46   75   74  108  107  138  137  157  156  190  189  223  222   -1
  560  591  592  623  624  655  656   -1
 1040 1039 1016 1015  996  995  972  971  949  948  919  918  884  883   -1
  684  683  652  651  620  619  588   -1


TIME
    1.000
QSEC
         1   8000.00
 1036 1041 1040 1045 1044   -1
         2   3000.00
 1028 1033 1032   -1
         3   3000.00
    7   20   19   26   25   32   31   -1

ZSEC
         1     45.000     45.000          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1


TIME
    2.000
QSEC
         1   8000.00
 1036 1041 1040 1045 1044   -1
         2   3000.00
 1028 1033 1032   -1
         3   3000.00
    7   20   19   26   25   32   31   -1

ZSEC
         1     45.450     45.450          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    3.000
QSEC
         1   8000.00
 1036 1041 1040 1045 1044   -1
         2   3000.00
 1028 1033 1032   -1
         3   3000.00
    7   20   19   26   25   32   31   -1

ZSEC
         1     45.750     45.750          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1
```

```
    4.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044    -1
       2   3000.00
 1028 1033 1032    -1
       3   3000.00
    7   20    19    26    25    32    31    -1

ZSEC
       1     45.900     45.900          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    5.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044    -1
       2   3000.00
 1028 1033 1032    -1
       3   3000.00
    7   20    19    26    25    32    31    -1

ZSEC
       1     45.750     45.750          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    6.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044    -1
       2   3000.00
 1028 1033 1032    -1
       3   3000.00
    7   20    19    26    25    32    31    -1

ZSEC
       1     45.450     45.450          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    7.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044    -1
       2   3000.00
 1028 1033 1032    -1
       3   3000.00
    7   20    19    26    25    32    31    -1

ZSEC
       1     45.000     45.000          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    8.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044    -1
```

```
       2   3000.00
 1028 1033 1032   -1
       3   3000.00
   7   20   19   26   25   32   31   -1

ZSEC
       1    44.550    44.550         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    9.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044   -1
       2   3000.00
 1028 1033 1032   -1
       3   3000.00
   7   20   19   26   25   32   31   -1

ZSEC
       1    44.250    44.250         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   10.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044   -1
       2   3000.00
 1028 1033 1032   -1
       3   3000.00
   7   20   19   26   25   32   31   -1

ZSEC
       1    44.100    44.100         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   11.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044   -1
       2   3000.00
 1028 1033 1032   -1
       3   3000.00
   7   20   19   26   25   32   31   -1

ZSEC
       1    44.250    44.250         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   12.000
QSEC
       1   8000.00
 1036 1041 1040 1045 1044   -1
       2   3000.00
 1028 1033 1032   -1
       3   3000.00
   7   20   19   26   25   32   31   -1
```

```
ZSEC
         1     44.550    44.550        1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   13.000
QSEC
         1   8000.00
 1036 1041 1040 1045 1044    -1
         2   3000.00
 1028 1033 1032    -1
         3   3000.00
    7   20   19   26   25   32   31   -1

ZSEC
         1     45.000    45.000        1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

LAST
```

```
TIME

SWMS                   1          1
SPRING TIDAL FLOW
    0    0    1    1    1    0    0    2    0    0    1
    1    1    1    1    0    0   98   99
         0        15         0      1400      1.000     13.000      1.000      1.000
       000      .000     1.937     1.000       .000   .990E+02      .500       .500
       100    10.000  .123E+01     1.000       .050       .000     .0000
PROP
         1     .0000     .0000     .0000      .0000    60.0000  .100E+03      .0000

FLUX
   46   75   74  108  107  138  137  157  156  190  189  223  222   -1
  560  591  592  623  624  655  656   -1
  280  308  306  334  332  360  358   -1
 1040 1039 1016 1015  996  995  972  971  949  948  919  918  884  883   -1
  684  683  652  651  620  619  588   -1

TIME
     1.000
QSEC
         1  25000.00
 1036 1041 1040 1045 1044   -1
         2  11200.00
 1028 1033 1032   -1
         3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
         1    45.000    45.000         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1


TIME
     2.000
QSEC
         1  25000.00
 1036 1041 1040 1045 1044   -1
         2  11200.00
 1028 1033 1032   -1
         3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
         1    45.600    45.600         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
     3.000
QSEC
         1  25000.00
 1036 1041 1040 1045 1044   -1
         2  11200.00
 1028 1033 1032   -1
         3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
         1    45.600    45.600         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1
```

```
    4.000
QSEC
       1  25000.00
 1036 1041 1040 1045 1044   -1
       2  11200.00
 1028 1033 1032   -1
       3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
       1     45.600     45.600          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    5.000
QSEC
       1  25000.00
 1036 1041 1040 1045 1044   -1
       2  11200.00
 1028 1033 1032   -1
       3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
       1     45.600     45.600          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    6.000
QSEC
       1  25000.00
 1036 1041 1040 1045 1044   -1
       2  11200.00
 1028 1033 1032   -1
       3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
       1     45.600     45.600          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    7.000
QSEC
       1  25000.00
 1036 1041 1040 1045 1044   -1
       2  11200.00
 1028 1033 1032   -1
       3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
       1     45.000     45.000          1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    8.000
QSEC
       1  25000.00
 1036 1041 1040 1045 1044   -1
```

```
        2  11200.00
 1028 1033 1032   -1
        3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
        1    44.400    44.400         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    9.000
QSEC
        1  25000.00
 1036 1041 1040 1045 1044   -1
        2  11200.00
 1028 1033 1032   -1
        3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
        1    44.400    44.400         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   10.000
QSEC
        1  25000.00
 1036 1041 1040 1045 1044   -1
        2  11200.00
 1028 1033 1032   -1
        3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
        1    44.400    44.400         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   11.000
QSEC
        1  25000.00
 1036 1041 1040 1045 1044   -1
        2  11200.00
 1028 1033 1032   -1
        3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
        1    44.400    44.400         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
   12.000
QSEC
        1  25000.00
 1036 1041 1040 1045 1044   -1
        2  11200.00
 1028 1033 1032   -1
        3  10300.00
    7   20   19   26   25   32   31   -1
```

```
ZSEC
         1    44.400    44.400         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

TIME
    13.000
QSEC
         1  25000.00
 1036 1041 1040 1045 1044    -1
         2  11200.00
 1028 1033 1032   -1
         3  10300.00
    7   20   19   26   25   32   31   -1

ZSEC
         1    45.000    45.000         1
  410  411  412  415  416  419  420  423  424  427  428  431  432  437  438  443
  444  449  450  455  456  461  462  467  468  473  474   -1

LAST
```

```
ANOMOD FILE
SWMS               1         1                                               1.000    13.000
   0    1    1     0    0    1
VECT         13.000                                                                      0

   1    0
     -1.00       .000        1.0        .070
      .200       .200
      .000       .000       .000        .000  1500.000  1500.000       .000
CONT         13.000                                                                      1

   1    2    1
      .000       .000       .100
      .200       .200       .200
      .000       .000       .000        .000  1500.000  1500.000       .000
FLUX         13.000                                                                      0

   1    1   -1
      .140       .070       .105
       .00        .00        .00         .00   1500.00       .00        .00
  46   75   74  108  107  138  137  157  156  190  189   -1
 168  169  170  173  174  177  178   -1
 332  335  336  339  340  545  544   -1
 354  357  358  361  362  513  512   -1
 588  593  592  597  596   -1
 556  561  560  565  564   -1
 915  914  880  879  848   -1
 856  857  852  853  848  849  844  845  840   -1
 532  531  500  499  464  463   -1

HIST          1.000    13.000
        74       1222
       107       1222
       137       1222
       170       1222
       332       1222
       336       1222
       340       1222
       354       1222
       358       1222
       362       1222
       588       1222
       592       1222
       596       1222
       556       1222
       560       1222
       564       1222
       880       1222
       846       1222
       852       1222

LAST
```

ANNEXURE II

Table 3: Temporal Variaticn of Flow at different node points(Neap Tides)

Node 74								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	0.036	-0.055	0.066	0.299	-0.456	0.546	8.3	45.48
2	0.022	-0.025	0.033	0.187	-0.213	0.284	8.515	45.695
3	0.022	-0.026	0.034	0.192	-0.227	0.297	8.726	45.906
4	0.041	-0.062	0.074	0.354	-0.535	0.642	8.635	45.815
5	0.058	-0.091	0.108	0.483	-0.757	0.898	8.322	45.502
6	0.072	-0.113	0.134	0.567	-0.889	1.054	7.869	45.049
7	0.079	-0.124	0.147	0.584	-0.917	1.087	7.396	44.576
8	0.074	-0.113	0.135	0.522	-0.797	0.953	7.052	44.232
9	0.062	-0.09	0.109	0.427	-0.619	0.752	6.882	44.062
10	0.039	-0.048	0.062	0.273	-0.336	0.433	6.995	44.175
11	0.022	-0.019	0.029	0.161	-0.139	0.213	7.32	44.5
12	0.011	-0.003	0.011	0.086	-0.023	0.089	7.788	44.968
Node 107								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	0.035	-0.058	0.068	0.29	-0.481	0.562	8.298	45.478
2	0.01	-0.012	0.016	0.085	-0.102	0.133	8.518	45.698
3	0.01	-0.012	0.016	0.087	-0.105	0.136	8.726	45.906
4	0.043	-0.07	0.082	0.371	-0.604	0.709	8.631	45.811
5	0.071	-0.118	0.138	0.591	-0.982	1.146	8.319	45.499
6	0.093	-0.156	0.182	0.732	-1.227	1.429	7.866	45.046
7	0.103	-0.174	0.202	0.762	-1.287	1.495	7.394	44.574
8	0.094	-0.155	0.181	0.663	-1.093	1.278	7.052	44.232
9	0.073	-0.116	0.137	0.503	-0.799	0.944	6.884	44.064
10	0.034	-0.046	0.057	0.238	-0.322	0.4	6.999	44.179
11	0.002	0.007	0.007	0.015	0.051	0.053	7.322	44.502
12	-0.019	0.038	0.042	-0.148	0.296	0.331	7.79	44.97
Node 137								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	0.027	-0.056	0.062	0.224	-0.465	0.516	8.296	45.476
2	0.006	-0.001	0.006	0.051	-0.009	0.052	8.52	45.7
3	0.006	-0.001	0.006	0.052	-0.009	0.053	8.726	45.906
4	0.038	-0.069	0.079	0.328	-0.595	0.68	8.628	45.808
5	0.069	-0.126	0.144	0.574	-1.048	1.195	8.316	45.496
6	0.095	-0.171	0.196	0.747	-1.345	1.538	7.863	45.043
7	0.11	-0.19	0.22	0.813	-1.404	1.623	7.391	44.571
8	0.102	-0.165	0.194	0.719	-1.164	1.368	7.052	44.232
9	0.081	-0.118	0.143	0.558	-0.812	0.985	6.885	44.065
10	0.042	-0.033	0.053	0.294	-0.231	0.374	7.002	44.182
11	0.011	0.03	0.032	0.081	0.22	0.234	7.325	44.505
12	-0.007	0.067	0.067	-0.055	0.522	0.525	7.792	44.972

Node 170								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.003	-0.054	0.054	-0.025	-0.448	0.448	8.289	45.469
2	0.001	0.027	0.027	0.009	0.23	0.23	8.53	45.71
3	0.001	0.023	0.023	0.009	0.201	0.201	8.726	45.906
4	-0.002	-0.07	0.07	-0.017	-0.603	0.603	8.615	45.795
5	-0.003	-0.142	0.142	-0.025	-1.179	1.179	8.304	45.484
6	-0.003	-0.2	0.2	-0.024	-1.57	1.57	7.85	45.03
7	-0.001	-0.221	0.221	-0.007	-1.631	1.631	7.382	44.562
8	0.002	-0.181	0.181	0.014	-1.276	1.276	7.052	44.232
9	0.006	-0.115	0.115	0.041	-0.792	0.794	6.891	44.071
10	0.011	0	0.011	0.077	0	0.077	7.017	44.197
11	0.012	0.078	0.079	0.088	0.572	0.579	7.336	44.516
12	0.012	0.124	0.125	0.094	0.967	0.971	7.798	44.978

Node 332								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.006	-0.064	0.064	-0.05	-0.53	0.532	8.278	45.458
2	0.004	0.058	0.058	0.034	0.496	0.497	8.55	45.73
3	0.003	0.039	0.039	0.026	0.34	0.341	8.724	45.904
4	-0.006	-0.096	0.096	-0.052	-0.825	0.827	8.593	45.773
5	-0.015	-0.192	0.193	-0.124	-1.591	1.596	8.287	45.467
6	-0.025	-0.271	0.272	-0.196	-2.123	2.132	7.835	45.015
7	-0.032	-0.292	0.294	-0.236	-2.154	2.167	7.376	44.556
8	-0.029	-0.227	0.229	-0.205	-1.603	1.616	7.061	44.241
9	-0.023	-0.137	0.139	-0.159	-0.946	0.959	6.906	44.086
10	-0.008	0.022	0.023	-0.056	0.155	0.165	7.044	44.224
11	0.003	0.124	0.124	0.022	0.912	0.912	7.354	44.534
12	0.012	0.188	0.188	0.094	1.468	1.471	7.809	44.989

Node 336								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.011	-0.074	0.075	-0.071	-0.478	0.483	6.459	45.459
2	0.003	0.05	0.05	0.02	0.336	0.337	6.729	45.729
3	0.003	0.032	0.032	0.021	0.221	0.222	6.904	45.904
4	-0.011	-0.108	0.109	-0.075	-0.732	0.735	6.774	45.774
5	-0.025	-0.207	0.209	-0.162	-1.339	1.348	6.467	45.467
6	-0.04	-0.287	0.29	-0.241	-1.727	1.743	6.016	45.016
7	-0.05	-0.308	0.312	-0.278	-1.712	1.734	5.557	44.557
8	-0.047	-0.242	0.247	-0.246	-1.268	1.292	5.241	44.241
9	-0.038	-0.148	0.153	-0.193	-0.753	0.777	5.086	44.086
10	-0.015	0.016	0.022	-0.078	0.084	0.115	5.223	44.223
11	0.001	0.12	0.12	0.006	0.664	0.664	5.533	44.533
12	0.013	0.185	0.185	0.078	1.108	1.111	5.988	44.988

Node340								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.011	-0.084	0.085	-0.071	-0.543	0.547	6.459	45.459
2	-0.003	0.041	0.041	-0.02	0.276	0.277	6.729	45.729
3	-0.002	0.022	0.022	-0.014	0.152	0.153	6.904	45.904
4	-0.01	-0.12	0.12	-0.068	-0.813	0.816	6.774	45.774
5	-0.019	-0.22	0.221	-0.123	-1.423	1.428	6.468	45.468
6	-0.029	-0.3	0.301	-0.174	-1.805	1.814	6.017	45.017
7	-0.038	-0.321	0.323	-0.211	-1.784	1.796	5.557	44.557
8	-0.039	-0.255	0.258	-0.204	-1.336	1.352	5.241	44.241
9	-0.035	-0.161	0.165	-0.178	-0.819	0.838	5.086	44.086
10	-0.023	0.005	0.024	-0.12	0.026	0.123	5.223	44.223
11	-0.012	0.111	0.112	-0.066	0.614	0.618	5.533	44.533
12	-0.003	0.178	0.178	-0.018	1.066	1.066	5.988	44.988

Node 354								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	0.001	-0.064	0.064	0.01	-0.646	.646 1	0.096	45.456
2	0.006	0.068	0.068	0.062	0.706	.708 1	0.375	45.735
3	0.006	0.046	0.046	0.063	0.485	.489 1	0.543	45.903
4	0.002	-0.101	0.101	0.021	-1.051	1.051 1	0.406	45.766
5	-0.002	-0.204	0.204	-0.02	-2.061	2.061 1	0.102	45.462
6	-0.008	-0.289	0.289	-0.077	-2.789	2.79	9.65	45.01
7	-0.011	-0.311	0.311	-0.101	-2.859	2.861	9.193	44.553
8	-0.011	-0.242	0.242	-0.098	-2.15	2.152	8.883	44.243
9	-0.008	-0.146	0.146	-0.07	-1.275	1.276	8.73	44.09
10	-0.001	0.025	0.025	-0.009	0.222	0.222	8.871	44.231
11	0.005	0.133	0.133	0.046	1.221	1.222	9.178	44.538
12	0.011	0.203	0.203	0.106	1.955	1.958	9.632	44.992

Node 358								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.004	-0.075	0.075	-0.026	-0.484	0.485	6.456	45.456
2	0.008	0.063	0.064	0.054	0.424	0.428	6.735	45.735
3	0.008	0.039	0.04	0.055	0.269	0.275	6.903	45.903
4	-0.003	-0.114	0.114	-0.02	-0.771	0.772	6.767	45.767
5	-0.014	-0.221	0.221	-0.09	-1.428	1.431	6.462	45.462
6	-0.027	-0.308	0.309	-0.162	-1.851	1.858	6.011	45.011
7	-0.035	-0.33	0.332	-0.194	-1.833	1.843	5.554	44.554
8	-0.034	-0.259	0.261	-0.178	-1.358	1.37	5.243	44.243
9	-0.026	-0.158	0.16	-0.132	-0.804	0.815	5.09	44.09
10	-0.007	0.022	0.023	-0.037	0.115	0.121	5.231	44.231
11	0.006	0.135	0.135	0.033	0.747	0.748	5.537	44.537
12	0.015	0.208	0.209	0.09	1.246	1.249	5.991	44.991

Node 362								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.003	-0.084	0.084	-0.019	-0.542	0.543	6.457	45.457
2	0.004	0.053	0.053	0.027	0.357	0.358	6.734	45.734
3	0.005	0.029	0.029	0.035	0.2	0.203	6.903	45.903
4	-0.001	-0.125	0.125	-0.007	-0.846	0.846	6.768	45.768
5	-0.009	-0.231	0.231	-0.058	-1.493	1.494	6.463	45.463
6	-0.018	-0.318	0.319	-0.108	-1.912	1.915	6.012	45.012
7	-0.026	-0.34	0.341	-0.144	-1.889	1.894	5.555	44.555
8	-0.027	-0.268	0.269	-0.142	-1.405	1.412	5.243	44.243
9	-0.024	-0.169	0.171	-0.122	-0.86	0.869	5.09	44.09
10	-0.012	0.01	0.016	-0.063	0.052	0.082	5.23	44.23
11	-0.003	0.124	0.124	-0.017	0.687	0.687	5.537	44.537
12	0.004	0.197	0.197	0.024	1.18	1.18	5.991	44.991

Node 588								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.01	-0.116	0.116	-0.101	-1.172	1.176 1	0.102	45.462
2	-0.015	-0.002	0.015	-0.155	-0.021	.157 1	0.365	45.725
3	-0.013	-0.019	0.023	-0.137	-0.2	.243 1	0.545	45.905
4	-0.008	-0.153	0.153	-0.083	-1.594	1.596 1	0.42	45.78
5	-0.006	-0.252	0.252	-0.061	-2.548	2.549 1	0.113	45.473
6	-0.005	-0.335	0.335	-0.048	-3.236	3.237	9.661	45.021
7	-0.007	-0.364	0.364	-0.064	-3.349	3.349	9.2	44.56
8	-0.013	-0.31	0.31	-0.115	-2.753	2.755	8.88	44.24
9	-0.019	-0.227	0.228	-0.166	-1.98	1.987	8.723	44.083
10	-0.028	-0.075	0.08	-0.248	-0.664	0.709	8.857	44.217
11	-0.032	0.026	0.041	-0.293	0.238	0.378	9.169	44.529
12	-0.032	0.091	0.096	-0.308	0.876	0.929	9.626	44.986

Node 592								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.008	-0.121	0.121	-0.081	-1.222	1.225 1	0.102	45.462
2	-0.013	-0.006	0.014	-0.135	-0.062	.148 1	0.365	45.725
3	-0.012	-0.024	0.027	-0.127	-0.253	.283 1	0.545	45.905
4	-0.007	-0.16	0.16	-0.073	-1.667	1.669 1	0.42	45.78
5	-0.006	-0.26	0.26	-0.061	-2.629	2.630 1	0.112	45.472
6	-0.005	-0.344	0.344	-0.048	-3.323	3.324	9.661	45.021
7	-0.007	-0.375	0.375	-0.064	-3.45	3.451	9.2	44.56
8	-0.012	-0.323	0.323	-0.107	-2.868	2.87	8.88	44.24
9	-0.017	-0.242	0.243	-0.148	-2.111	2.116	8.723	44.083
10	-0.025	-0.09	0.093	-0.221	-0.797	0.827	8.857	44.217
11	-0.028	0.012	0.03	-0.257	0.11	0.279	9.169	44.529
12	-0.029	0.079	0.084	-0.279	0.76	0.81	9.626	44.986

Node 596

Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.005	-0.129	0.129	-0.051	-1.303	1.304 1	0.102	45.462
2	-0.009	-0.012	0.015	-0.093	-0.124	.155 1	0.365	45.725
3	-0.007	-0.031	0.032	-0.074	-0.327	.335 1	0.545	45.905
4	-0.004	-0.169	0.169	-0.042	-1.761	1.761 1	0.42	45.78
5	-0.003	-0.272	0.272	-0.03	-2.75	2.751 1	0.112	45.472
6	-0.001	-0.36	0.36	-0.01	-3.478	3.478	9.661	45.021
7	-0.002	-0.394	0.394	-0.018	-3.624	3.624	9.199	44.559
8	-0.006	-0.343	0.343	-0.053	-3.046	3.046	8.88	44.24
9	-0.01	-0.262	0.262	-0.087	-2.285	2.287	8.723	44.083
10	-0.016	-0.108	0.109	-0.142	-0.957	0.967	8.858	44.218
11	-0.019	-0.005	0.02	-0.174	-0.046	0.18	9.17	44.53
12	-0.02	0.063	0.066	-0.193	0.606	0.636	9.626	44.986

Node 556

Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.003	-0.113	0.113	-0.03	-1.141	1.142 1	0.099	45.459
2	-0.009	0.011	0.014	-0.093	0.114	.147 1	0.37	45.73
3	-0.006	-0.01	0.012	-0.063	-0.105	.123 1	0.544	45.904
4	0	-0.155	0.155	0	-1.614	1.614 1	0.414	45.774
5	0.002	-0.261	0.261	0.02	-2.638	2.638 1	0.108	45.468
6	0.004	-0.349	0.349	0.039	-3.37	3.37	9.656	45.016
7	0.002	-0.378	0.378	0.018	-3.476	3.477	9.197	44.557
8	-0.004	-0.318	0.318	-0.036	-2.824	2.825	8.882	44.242
9	-0.01	-0.228	0.228	-0.087	-1.99	1.991	8.726	44.086
10	-0.02	-0.064	0.067	-0.177	-0.567	0.594	8.864	44.224
11	-0.023	0.043	0.049	-0.211	0.394	0.447	9.173	44.533
12	-0.023	0.113	0.115	-0.221	1.088	1.11	9.629	44.989

Node 560

Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.001	-0.118	0.118	-0.01	-1.192	1.192 1	0.099	45.459
2	-0.007	0.007	0.01	-0.073	0.073	.103 1	0.37	45.73
3	-0.005	-0.014	0.015	-0.053	-0.148	.157 1	0.544	45.904
4	0.002	-0.16	0.16	0.021	-1.666	1.666 1	0.414	45.774
5	0.005	-0.268	0.268	0.051	-2.709	2.709 1	0.107	45.467
6	0.008	-0.358	0.358	0.077	-3.457	3.458	9.656	45.016
7	0.007	-0.39	0.39	0.064	-3.587	3.587	9.197	44.557
8	0.001	-0.331	0.331	0.009	-2.94	2.94	8.881	44.241
9	-0.006	-0.241	0.241	-0.052	-2.103	2.104	8.726	44.086
10	-0.016	-0.076	0.078	-0.142	-0.674	0.688	8.864	44.224
11	-0.02	0.032	0.038	-0.183	0.294	0.346	9.174	44.534
12	-0.021	0.102	0.104	-0.202	0.982	1.003	9.629	44.989

Node 564								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m/s)	Total (sq.m/s)	Depth (m)	WESL (m)
1	0	-0.123	0.123	0	-1.242	1.242 1	0.099	45.459
2	-0.005	0.002	0.005	-0.052	0.021	.056 1	0.37	45.73
3	-0.003	-0.02	0.02	-0.032	-0.211	.213 1	0.544	45.904
4	0.002	-0.168	0.168	0.021	-1.749	1.750 1	0.413	45.773
5	0.005	-0.277	0.277	0.051	-2.8	2.800 1	0.107	45.467
6	0.007	-0.371	0.371	0.068	-3.582	3.583	9.655	45.015
7	0.007	-0.405	0.405	0.064	-3.724	3.725	9.196	44.556
8	0.003	-0.347	0.347	0.027	-3.082	3.082	8.881	44.241
9	-0.003	-0.257	0.257	-0.026	-2.243	2.243	8.726	44.086
10	-0.01	-0.09	0.091	-0.089	-0.798	0.803	8.865	44.225
11	-0.014	0.018	0.023	-0.128	0.165	0.209	9.174	44.534
12	-0.014	0.089	0.09	-0.135	0.857	0.868	9.63	44.99

Node 880								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m/s)	Total (sq.m/s)	Depth (m)	WESL (m)
1	-0.019	-0.247	0.248	-0.146	-1.896	1.902	7.677	45.477
2	-0.015	-0.193	0.194	-0.119	-1.525	1.529	7.9	45.7
3	-0.012	-0.189	0.189	-0.097	-1.532	1.535	8.106	45.906
4	-0.007	-0.248	0.248	-0.056	-1.986	1.987	8.009	45.809
5	-0.002	-0.301	0.301	-0.015	-2.317	2.317	7.698	45.498
6	0.005	-0.349	0.349	0.036	-2.529	2.529	7.246	45.046
7	0.012	-0.375	0.375	0.081	-2.541	2.542	6.775	44.575
8	0.016	-0.361	0.361	0.103	-2.323	2.326	6.436	44.236
9	0.018	-0.328	0.328	0.113	-2.056	2.059	6.269	44.069
10	0.016	-0.255	0.256	0.102	-1.628	1.631	6.385	44.185
11	0.015	-0.196	0.197	0.101	-1.314	1.318	6.706	44.506
12	0.015	-0.153	0.154	0.108	-1.097	1.102	7.171	44.971

Node 846								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m/s)	Total (sq.m/s)	Depth (m)	WESL (m)
1	-0.067	-0.164	0.177	-0.484	-1.185	1.28	7.223	45.473
2	-0.062	-0.098	0.116	-0.462	-0.731	0.865	7.455	45.705
3	-0.056	-0.098	0.113	-0.429	-0.75	0.864	7.656	45.906
4	-0.052	-0.17	0.178	-0.393	-1.284	1.343	7.553	45.803
5	-0.048	-0.23	0.235	-0.348	-1.666	1.702	7.242	45.492
6	-0.043	-0.28	0.283	-0.292	-1.901	1.923	6.789	45.039
7	-0.037	-0.304	0.306	-0.234	-1.921	1.935	6.32	44.57
8	-0.033	-0.279	0.281	-0.197	-1.67	1.681	5.984	44.234
9	-0.03	-0.232	0.234	-0.175	-1.35	1.361	5.82	44.07
10	-0.028	-0.142	0.145	-0.166	-0.843	0.86	5.94	44.19
11	-0.023	-0.075	0.078	-0.144	-0.47	0.491	6.26	44.51
12	-0.017	-0.03	0.034	-0.114	-0.202	0.232	6.724	44.974

Node 852								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WESL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m/s)	(sq.m/s)	(m)	(m)
1	-0.024	-0.222	0.223	-0.243	-2.246	2.259 1	0.115	45.475
2	-0.021	-0.164	0.165	-0.217	-1.696	1.710 1	0.343	45.703
3	-0.02	-0.166	0.167	-0.211	-1.751	1.763 1	0.547	45.907
4	-0.02	-0.241	0.242	-0.209	-2.517	2.526 1	0.445	45.805
5	-0.02	-0.306	0.307	-0.203	-3.101	3.108 1	0.134	45.494
6	-0.02	-0.364	0.365	-0.194	-3.524	3.53	9.682	45.042
7	-0.019	-0.396	0.396	-0.175	-3.648	3.652	9.212	44.572
8	-0.018	-0.381	0.381	-0.16	-3.381	3.385	8.875	44.235
9	-0.015	-0.342	0.342	-0.131	-2.979	2.982	8.71	44.07
10	-0.012	-0.259	0.259	-0.106	-2.286	2.289	8.828	44.188
11	-0.008	-0.194	0.194	-0.073	-1.775	1.776	9.149	44.509
12	-0.005	-0.148	0.148	-0.048	-1.423	1.424	9.613	44.973

Table 4: Effect of Eddy viscosity on flow velocity

Node 74				**Node 107**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40	Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.066	0.067	0.067	1	0.068	0.07	0.07
2	0.033	0.03	0.03	2	0.016	0.013	0.013
3	0.034	0.033	0.033	3	0.016	0.016	0.016
4	0.074	0.076	0.076	4	0.082	0.081	0.081
5	0.108	0.109	0.109	5	0.138	0.135	0.135
6	0.134	0.136	0.136	6	0.182	0.178	0.178
7	0.147	0.149	0.149	7	0.202	0.199	0.199
8	0.135	0.136	0.136	8	0.181	0.178	0.178
9	0.109	0.11	0.11	9	0.137	0.167	0.167
10	0.062	0.062	0.062	10	0.057	0.058	0.058
11	0.029	0.029	0.029	11	0.007	0.006	0.006
12	0.011	0.013	0.013	12	0.042	0.04	0.04
Node 137				**Node 170**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40	Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.062	0.066	0.066	1	0.054	0.053	0.053
2	0.006	0.008	0.008	2	0.027	0.036	0.036
3	0.006	0.009	0.009	3	0.023	0.026	0.026
4	0.079	0.078	0.078	4	0.07	0.07	0.07
5	0.144	0.141	0.141	5	0.142	0.142	0.142
6	0.196	0.192	0.192	6	0.2	0.2	0.2
7	0.22	0.215	0.215	7	0.221	0.222	0.222
8	0.194	0.191	0.191	8	0.181	0.181	0.181
9	0.143	0.142	0.142	9	0.115	0.115	0.115
10	0.053	0.055	0.055	10	0.011	0.013	0.013
11	0.032	0.031	0.031	11	0.079	0.08	0.08
12	0.067	0.065	0.065	12	0.125	0.126	0.126
Node 332				**Node 336**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40	Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.064	0.062	0.062	1	0.075	0.073	0.073
2	0.058	0.067	0.067	2	0.05	0.06	0.06
3	0.039	0.043	0.043	3	0.032	0.034	0.034
4	0.096	0.096	0.096	4	0.109	0.108	0.108
5	0.193	0.194	0.194	5	0.209	0.208	0.208
6	0.272	0.273	0.273	6	0.29	0.289	0.289
7	0.294	0.295	0.295	7	0.312	0.311	0.311
8	0.229	0.231	0.231	8	0.247	0.246	0.246
9	0.139	0.14	0.14	9	0.153	0.153	0.153
10	0.023	0.024	0.024	10	0.022	0.024	0.024
11	0.124	0.123	0.123	11	0.12	0.121	0.121
12	0.188	0.188	0.188	12	0.185	0.185	0.185

Node340					**Node 354**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40		Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.085	0.084	0.084		1	0.064	0.062	0.062
2	0.041	0.051	0.051		2	0.068	0.077	0.077
3	0.022	0.025	0.025		3	0.046	0.049	0.049
4	0.12	0.12	0.12		4	0.101	0.101	0.101
5	0.221	0.22	0.22		5	0.204	0.204	0.204
6	0.301	0.3	0.3		6	0.289	0.288	0.288
7	0.323	0.32	0.32		7	0.311	0.311	0.311
8	0.258	0.255	0.255		8	0.242	0.242	0.242
9	0.165	0.163	0.163		9	0.146	0.146	0.146
10	0.024	0.026	0.026		10	0.025	0.024	0.024
11	0.112	0.115	0.115		11	0.133	0.133	0.133
12	0.178	0.181	0.181		12	0.203	0.203	0.203
Node 358					**Node 362**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40		Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.075	0.073	0.073		1	0.084	0.083	0.083
2	0.064	0.074	0.074		2	0.053	0.062	0.062
3	0.04	0.043	0.043		3	0.029	0.033	0.033
4	0.114	0.114	0.114		4	0.125	0.125	0.125
5	0.221	0.22	0.22		5	0.231	0.231	0.231
6	0.309	0.308	0.308		6	0.319	0.318	0.318
7	0.332	0.331	0.331		7	0.341	0.34	0.34
8	0.261	0.26	0.26		8	0.269	0.268	0.268
9	0.16	0.16	0.16		9	0.171	0.169	0.169
10	0.023	0.024	0.024		10	0.016	0.018	0.018
11	0.135	0.137	0.137		11	0.124	0.126	0.126
12	0.209	0.21	0.21		12	0.197	0.2	0.2
Node 588					**Node 592**			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40		Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.116	0.118	0.118		1	0.121	0.123	0.123
2	0.015	0.017	0.017		2	0.014	0.014	0.014
3	0.023	0.023	0.023		3	0.027	0.026	0.026
4	0.153	0.155	0.155		4	0.16	0.161	0.161
5	0.252	0.253	0.253		5	0.26	0.261	0.261
6	0.335	0.335	0.335		6	0.344	0.345	0.345
7	0.364	0.364	0.364		7	0.375	0.376	0.376
8	0.31	0.311	0.311		8	0.323	0.324	0.324
9	0.228	0.228	0.228		9	0.243	0.244	0.244
10	0.08	0.082	0.082		10	0.093	0.096	0.096
11	0.041	0.043	0.043		11	0.03	0.032	0.032
12	0.096	0.097	0.097		12	0.084	0.082	0.082

Node 596			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.129	0.131	0.131
2	0.015	0.011	0.011
3	0.032	0.032	0.032
4	0.169	0.172	0.172
5	0.272	0.274	0.274
6	0.36	0.361	0.361
7	0.394	0.396	0.396
8	0.343	0.345	0.345
9	0.262	0.264	0.264
10	0.109	0.112	0.112
11	0.02	0.021	0.021
12	0.066	0.064	0.064

Node 556			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.113	0.114	0.114
2	0.014	0.02	0.02
3	0.012	0.011	0.011
4	0.155	0.157	0.157
5	0.261	0.262	0.262
6	0.349	0.35	0.35
7	0.378	0.379	0.379
8	0.318	0.319	0.319
9	0.228	0.229	0.229
10	0.067	0.068	0.068
11	0.049	0.05	0.05
12	0.115	0.115	0.115

Node 560			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.118	0.119	0.119
2	0.01	0.016	0.016
3	0.015	0.014	0.014
4	0.16	0.163	0.163
5	0.268	0.27	0.27
6	0.358	0.361	0.361
7	0.39	0.393	0.393
8	0.331	0.334	0.334
9	0.241	0.244	0.244
10	0.078	0.08	0.08
11	0.038	0.037	0.037
12	0.104	0.103	0.103

Node 564			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.123	0.125	0.125
2	0.005	0.009	0.009
3	0.02	0.019	0.019
4	0.168	0.171	0.171
5	0.277	0.281	0.281
6	0.371	0.376	0.376
7	0.405	0.411	0.411
8	0.347	0.352	0.352
9	0.257	0.261	0.261
10	0.091	0.095	0.095
11	0.023	0.021	0.021
12	0.09	0.087	0.087

Node 880			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.248	0.246	0.246
2	0.194	0.185	0.185
3	0.189	0.182	0.182
4	0.248	0.237	0.237
5	0.301	0.281	0.281
6	0.349	0.32	0.32
7	0.375	0.339	0.339
8	0.361	0.322	0.322
9	0.328	0.286	0.286
10	0.256	0.217	0.217
11	0.197	0.165	0.165
12	0.154	0.129	0.129

Node 846			
Time(hrs)	E.V.=100	E.V.=50	E.V.=40
1	0.177	0.176	0.176
2	0.116	0.11	0.11
3	0.113	0.112	0.112
4	0.178	0.18	0.18
5	0.235	0.236	0.236
6	0.283	0.288	0.288
7	0.306	0.313	0.313
8	0.281	0.291	0.291
9	0.234	0.246	0.246
10	0.145	0.155	0.155
11	0.078	0.087	0.087
12	0.034	0.04	0.04

Node 852								
Time(hrs)	E.V.=100	E.V.=50	E.V.=40					
1	0.223	0.232	0.232					
2	0.165	0.168	0.168					
3	0.167	0.174	0.174					
4	0.242	0.251	0.251					
5	0.307	0.316	0.316					
6	0.365	0.37	0.37					
7	0.396	0.4	0.4					
8	0.381	0.384	0.384					
9	0.342	0.346	0.346					
10	0.259	0.264	0.264					
11	0.194	0.202	0.202					
12	0.148	0.159	0.159					

Table 5: Temporal Variation of Flow at Different node points (Spring Tides)								
Node 74								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	0.129	-0.19	0.23	1.012	-1.49	1.801	7.842	45.022
2	0.138	-0.198	0.241	1.08	-1.549	1.888	7.823	45.003
3	0.143	-0.201	0.247	1.118	-1.571	1.928	7.815	44.995
4	0.146	-0.203	0.25	1.141	-1.587	1.954	7.816	44.996
5	0.148	-0.206	0.254	1.157	-1.61	1.983	7.817	44.997
6	0.15	-0.208	0.256	1.173	-1.626	2.005	7.818	44.998
7	0.151	-0.209	0.258	1.181	-1.634	2.016	7.818	44.998
8	0.151	-0.21	0.259	1.181	-1.642	2.022	7.818	44.998
9	0.151	-0.21	0.259	1.181	-1.642	2.022	7.818	44.998
10	0.151	-0.21	0.259	1.181	-1.642	2.022	7.819	44.999
11	0.126	-0.162	0.205	1.025	-1.318	1.67	8.137	45.317
12	0.158	-0.228	0.277	1.257	-1.814	2.206	7.954	45.134
Node 107								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	0.122	-0.197	0.232	0.956	-1.544	1.816	7.839	45.019
2	0.133	-0.208	0.247	1.04	-1.627	1.931	7.822	45.002
3	0.139	-0.21	0.252	1.086	-1.641	1.968	7.814	44.994
4	0.143	-0.212	0.256	1.118	-1.657	1.998	7.815	44.995
5	0.146	-0.215	0.26	1.141	-1.68	2.031	7.816	44.996
6	0.148	-0.217	0.263	1.157	-1.696	2.053	7.817	44.997
7	0.149	-0.218	0.264	1.165	-1.704	2.064	7.817	44.997
8	0.15	-0.219	0.265	1.173	-1.712	2.075	7.817	44.997
9	0.15	-0.219	0.265	1.173	-1.712	2.075	7.817	44.997
10	0.149	-0.218	0.264	1.165	-1.704	2.064	7.818	44.998
11	0.11	-0.146	0.183	0.896	-1.189	1.488	8.141	45.321
12	0.164	-0.248	0.297	1.303	-1.971	2.363	7.947	45.127
Node 137								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	0.107	-0.186	0.215	0.839	-1.458	1.682	7.837	45.017
2	0.126	-0.194	0.231	0.985	-1.517	1.809	7.82	45
3	0.139	-0.193	0.238	1.086	-1.508	1.858	7.813	44.993
4	0.147	-0.192	0.242	1.149	-1.5	1.89	7.814	44.994
5	0.154	-0.193	0.247	1.204	-1.508	1.93	7.815	44.995
6	0.158	-0.194	0.25	1.235	-1.516	1.955	7.815	44.995
7	0.161	-0.195	0.253	1.258	-1.524	1.976	7.816	44.996
8	0.162	-0.195	0.254	1.266	-1.524	1.981	7.816	44.996
9	0.162	-0.195	0.254	1.266	-1.524	1.981	7.816	44.996
10	0.162	-0.195	0.254	1.266	-1.524	1.982	7.817	44.997
11	0.126	-0.107	0.165	1.026	-0.871	1.346	8.144	45.324
12	0.175	-0.235	0.293	1.39	-1.866	2.326	7.94	45.12

Node 170								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.003	-0.166	0.166	-0.023	-1.3	1.3	7.829	45.009
2	0.003	-0.164	0.164	0.023	-1.282	1.283	7.819	44.999
3	0.01	-0.151	0.151	0.078	-1.18	1.183	7.815	44.995
4	0.015	-0.142	0.143	0.117	-1.11	1.116	7.815	44.995
5	0.018	-0.136	0.137	0.141	-1.063	1.072	7.816	44.996
6	0.022	-0.133	0.135	0.172	-1.04	1.054	7.817	44.997
7	0.024	-0.13	0.132	0.188	-1.016	1.033	7.817	44.997
8	0.026	-0.128	0.131	0.203	-1.001	1.021	7.817	44.997
9	0.027	-0.128	0.131	0.211	-1.001	1.023	7.817	44.997
10	0.028	-0.128	0.131	0.219	-1.001	1.024	7.817	44.997
11	0.037	-0.006	0.037	0.302	-0.049	0.306	8.162	45.342
12	0.024	-0.197	0.198	0.19	-1.559	1.571	7.914	45.094

Node 332								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.051	-0.185	0.192	-0.399	-1.448	1.502	7.825	45.005
2	-0.057	-0.182	0.191	-0.446	-1.423	1.491	7.82	45
3	-0.06	-0.163	0.174	-0.469	-1.274	1.358	7.818	44.998
4	-0.062	-0.146	0.159	-0.485	-1.141	1.24	7.818	44.998
5	-0.062	-0.132	0.146	-0.485	-1.032	1.14	7.819	44.999
6	-0.06	-0.118	0.132	-0.469	-0.923	1.035	7.819	44.999
7	-0.056	-0.104	0.118	-0.438	-0.813	0.923	7.818	44.998
8	-0.05	-0.091	0.104	-0.391	-0.711	0.812	7.818	44.998
9	-0.042	-0.08	0.09	-0.328	-0.625	0.706	7.818	44.998
10	-0.033	-0.07	0.077	-0.258	-0.547	0.605	7.818	44.998
11	-0.013	0.108	0.109	-0.106	0.885	0.891	8.191	45.371
12	-0.025	-0.173	0.175	-0.197	-1.361	1.375	7.869	45.049

Node 336								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.082	-0.212	0.227	-0.492	-1.273	1.365	6.005	45.005
2	-0.094	-0.209	0.229	-0.564	-1.254	1.375	6	45
3	-0.101	-0.189	0.214	-0.606	-1.134	1.285	5.998	44.998
4	-0.106	-0.171	0.201	-0.636	-1.026	1.207	5.998	44.998
5	-0.108	-0.156	0.19	-0.648	-0.936	1.138	5.999	44.999
6	-0.106	-0.141	0.176	-0.636	-0.846	1.058	5.999	44.999
7	-0.101	-0.127	0.162	-0.606	-0.762	0.973	5.998	44.998
8	-0.092	-0.114	0.146	-0.552	-0.684	0.879	5.998	44.998
9	-0.081	-0.102	0.13	-0.486	-0.612	0.781	5.998	44.998
10	-0.067	-0.092	0.114	-0.402	-0.552	0.683	5.998	44.998
11	-0.037	0.092	0.099	-0.236	0.586	0.632	6.369	45.369
12	-0.051	-0.197	0.203	-0.309	-1.192	1.231	6.05	45.05

Node 340								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.09	-0.241	0.257	-0.541	-1.447	1.545	6.006	45.006
2	-0.106	-0.24	0.262	-0.636	-1.44	1.574	6.001	45.001
3	-0.116	-0.222	0.25	-0.696	-1.332	1.502	5.998	44.998
4	-0.125	-0.206	0.241	-0.75	-1.236	1.446	5.999	44.999
5	-0.13	-0.193	0.233	-0.78	-1.158	1.396	5.999	44.999
6	-0.131	-0.18	0.223	-0.786	-1.08	1.336	5.999	44.999
7	-0.127	-0.168	0.211	-0.762	-1.008	1.263	5.998	44.998
8	-0.118	-0.157	0.196	-0.708	-0.942	1.178	5.998	44.998
9	-0.106	-0.147	0.181	-0.636	-0.882	1.087	5.998	44.998
10	-0.091	-0.138	0.165	-0.546	-0.828	0.991	5.998	44.998
11	-0.07	0.045	0.083	-0.446	0.287	0.53	6.368	45.368
12	-0.065	-0.243	0.252	-0.393	-1.47	1.522	6.051	45.051

Node 354								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.026	-0.187	0.189	-0.251	-1.803	1.821	9.643	45.003
2	-0.032	-0.186	0.189	-0.308	-1.793	1.819	9.64	45
3	-0.036	-0.17	0.174	-0.347	-1.638	1.675	9.638	44.998
4	-0.039	-0.154	0.159	-0.376	-1.484	1.531	9.639	44.999
5	-0.042	-0.141	0.147	-0.405	-1.359	1.418	9.639	44.999
6	-0.043	-0.128	0.135	-0.414	-1.234	1.302	9.639	44.999
7	-0.042	-0.115	0.122	-0.405	-1.108	1.18	9.639	44.999
8	-0.04	-0.102	0.11	-0.386	-0.983	1.056	9.639	44.999
9	-0.036	-0.091	0.098	-0.347	-0.877	0.943	9.639	44.999
10	-0.031	-0.08	0.086	-0.299	-0.771	0.827	9.639	44.999
11	-0.02	0.113	0.115	-0.2	1.132	1.150 1	0.018	45.378
12	-0.024	-0.194	0.195	-0.232	-1.877	1.891	9.675	45.035

Node 358								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.057	-0.217	0.224	-0.342	-1.303	1.347	6.004	45.004
2	-0.068	-0.217	0.227	-0.408	-1.302	1.364	6	45
3	-0.076	-0.2	0.214	-0.456	-1.2	1.284	5.999	44.999
4	-0.082	-0.185	0.202	-0.492	-1.11	1.214	5.999	44.999
5	-0.088	-0.172	0.193	-0.528	-1.032	1.159	5.999	44.999
6	-0.09	-0.159	0.183	-0.54	-0.954	1.096	5.999	44.999
7	-0.09	-0.146	0.172	-0.54	-0.876	1.029	5.999	44.999
8	-0.087	-0.133	0.159	-0.522	-0.798	0.953	5.999	44.999
9	-0.08	-0.121	0.145	-0.48	-0.726	0.87	5.999	44.999
10	-0.071	-0.11	0.131	-0.426	-0.66	0.785	5.999	44.999
11	-0.047	0.092	0.103	-0.3	0.587	0.659	6.377	45.377
12	-0.06	-0.228	0.236	-0.362	-1.376	1.423	6.037	45.037

Node 362								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.064	-0.242	0.25	-0.384	-1.453	1.503	6.004	45.004
2	-0.077	-0.244	0.256	-0.462	-1.464	1.535	6.001	45.001
3	-0.089	-0.229	0.246	-0.534	-1.374	1.474	5.999	44.999
4	-0.099	-0.216	0.238	-0.594	-1.296	1.425	5.999	44.999
5	-0.107	-0.206	0.232	-0.642	-1.236	1.393	5.999	44.999
6	-0.112	-0.196	0.226	-0.672	-1.176	1.354	5.999	44.999
7	-0.114	-0.186	0.218	-0.684	-1.116	1.309	5.999	44.999
8	-0.111	-0.176	0.208	-0.666	-1.056	1.248	5.999	44.999
9	-0.105	-0.166	0.196	-0.63	-0.996	1.178	5.999	44.999
10	-0.095	-0.158	0.184	-0.57	-0.948	1.106	5.999	44.999
11	-0.078	0.04	0.088	-0.497	0.255	0.559	6.376	45.376
12	-0.076	-0.275	0.285	-0.459	-1.66	1.723	6.038	45.038

Node 588								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.069	-0.369	0.375	-0.666	-3.562	3.623	9.652	45.012
2	-0.083	-0.394	0.403	-0.8	-3.799	3.883	9.643	45.003
3	-0.095	-0.402	0.413	-0.916	-3.875	3.982	9.64	45
4	-0.104	-0.414	0.427	-1.003	-3.991	4.115	9.64	45
5	-0.109	-0.429	0.443	-1.051	-4.136	4.267	9.64	45
6	-0.111	-0.442	0.456	-1.07	-4.261	4.393	9.64	45
7	-0.109	-0.454	0.467	-1.051	-4.376	4.5	9.639	44.999
8	-0.103	-0.464	0.475	-0.993	-4.472	4.581	9.639	44.999
9	-0.094	-0.471	0.48	-0.906	-4.539	4.629	9.638	44.998
10	-0.083	-0.476	0.483	-0.8	-4.588	4.657	9.638	44.998
11	-0.085	-0.319	0.33	-0.85	-3.19	3.301 1	0	45.36
12	-0.054	-0.584	0.586	-0.524	-5.667	5.691	9.703	45.063

Node 592								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.058	-0.391	0.395	-0.56	-3.774	3.815	9.652	45.012
2	-0.07	-0.422	0.428	-0.675	-4.069	4.125	9.643	45.003
3	-0.079	-0.438	0.445	-0.762	-4.222	4.29	9.64	45
4	-0.086	-0.457	0.465	-0.829	-4.405	4.483	9.64	45
5	-0.091	-0.48	0.489	-0.877	-4.627	4.71	9.64	45
6	-0.092	-0.502	0.51	-0.887	-4.839	4.92	9.64	45
7	-0.091	-0.521	0.529	-0.877	-5.022	5.098	9.639	44.999
8	-0.086	-0.538	0.545	-0.829	-5.186	5.252	9.639	44.999
9	-0.078	-0.552	0.557	-0.752	-5.321	5.374	9.639	44.999
10	-0.07	-0.563	0.567	-0.675	-5.426	5.468	9.638	44.998
11	-0.072	-0.409	0.415	-0.72	-4.09	4.153 1	0.001	45.361
12	-0.046	-0.68	0.682	-0.446	-6.598	6.613	9.703	45.063

Node 596								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.034	-0.421	0.422	-0.328	-4.063	4.076	9.651	45.011
2	-0.04	-0.458	0.46	-0.386	-4.416	4.433	9.642	45.002
3	-0.044	-0.478	0.48	-0.424	-4.607	4.627	9.639	44.999
4	-0.047	-0.503	0.505	-0.453	-4.848	4.87	9.639	44.999
5	-0.05	-0.532	0.534	-0.482	-5.128	5.151	9.639	44.999
6	-0.05	-0.56	0.562	-0.482	-5.398	5.419	9.639	44.999
7	-0.049	-0.586	0.588	-0.472	-5.648	5.668	9.638	44.998
8	-0.046	-0.609	0.611	-0.443	-5.87	5.886	9.638	44.998
9	-0.041	-0.63	0.631	-0.395	-6.072	6.085	9.638	44.998
10	-0.036	-0.647	0.648	-0.347	-6.236	6.245	9.638	44.998
11	-0.039	-0.494	0.496	-0.39	-4.94	4.956 1	0.001	45.361
12	-0.021	-0.776	0.776	-0.204	-7.528	7.531	9.701	45.061

Node 556								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.047	-0.354	0.357	-0.453	-3.415	3.445	9.648	45.008
2	-0.059	-0.376	0.381	-0.569	-3.625	3.67	9.642	45.002
3	-0.071	-0.382	0.389	-0.684	-3.682	3.745	9.639	44.999
4	-0.08	-0.391	0.399	-0.771	-3.769	3.847	9.639	44.999
5	-0.088	-0.404	0.413	-0.848	-3.895	3.986	9.64	45
6	-0.093	-0.417	0.427	-0.896	-4.019	4.118	9.639	44.999
7	-0.094	-0.428	0.438	-0.906	-4.125	4.224	9.639	44.999
8	-0.092	-0.438	0.448	-0.887	-4.222	4.314	9.639	44.999
9	-0.087	-0.446	0.454	-0.839	-4.299	4.38	9.638	44.998
10	-0.079	-0.453	0.46	-0.761	-4.366	4.432	9.638	44.998
11	-0.085	-0.281	0.294	-0.851	-2.812	2.938 1	0.008	45.368
12	-0.052	-0.577	0.579	-0.504	-5.591	5.614	9.69	45.05

Node 560								
Time (hours)	X-velocity (m/s)	Y-velocity (m/s)	Total (m/s)	X-unit flow (sq.m/s)	Y-unit flow (sq.m./s)	Total (sq.m/s)	Depth (m)	WSEL (m)
1	-0.035	-0.372	0.374	-0.338	-3.589	3.605	9.648	45.008
2	-0.045	-0.399	0.402	-0.434	-3.847	3.871	9.641	45.001
3	-0.054	-0.411	0.415	-0.521	-3.962	3.996	9.639	44.999
4	-0.062	-0.426	0.43	-0.598	-4.106	4.149	9.639	44.999
5	-0.068	-0.446	0.451	-0.655	-4.299	4.349	9.639	44.999
6	-0.072	-0.466	0.472	-0.694	-4.492	4.545	9.639	44.999
7	-0.073	-0.485	0.49	-0.704	-4.674	4.727	9.638	44.998
8	-0.072	-0.502	0.507	-0.694	-4.838	4.888	9.638	44.998
9	-0.067	-0.517	0.521	-0.646	-4.983	5.025	9.638	44.998
10	-0.061	-0.53	0.533	-0.588	-5.108	5.141	9.637	44.997
11	-0.068	-0.359	0.365	-0.681	-3.593	3.657 1	0.008	45.368
12	-0.037	-0.665	0.666	-0.358	-6.443	6.452	9.688	45.048

Node 564									
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.02	-0.394	0.395	-0.193	-3.801	3.806	9.648	45.008
2	-0.026	-0.427	0.428	-0.251	-4.117	4.124	9.641	45.001
3	-0.031	-0.443	0.444	-0.299	-4.27	4.28	9.638	44.998
4	-0.036	-0.464	0.465	-0.347	-4.472	4.485	9.638	44.998
5	-0.039	-0.49	0.492	-0.376	-4.723	4.738	9.639	44.999
6	-0.041	-0.516	0.518	-0.395	-4.973	4.989	9.638	44.998
7	-0.041	-0.542	0.544	-0.395	-5.224	5.239	9.638	44.998
8	-0.04	-0.566	0.567	-0.385	-5.455	5.468	9.637	44.997
9	-0.037	-0.588	0.589	-0.357	-5.667	5.678	9.637	44.997
10	-0.032	-0.608	0.609	-0.308	-5.859	5.867	9.637	44.997
11	-0.038	-0.438	0.44	-0.38	-4.384	4.400 1	0.009	45.369
12	-0.016	-0.759	0.759	-0.155	-7.352	7.353	9.686	45.046

Node 880								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.019	-0.72	0.72	-0.138	-5.211	5.212	7.237	45.037
2	-0.009	-0.71	0.71	-0.065	-5.117	5.117	7.207	45.007
3	0.007	-0.69	0.69	0.05	-4.967	4.968	7.199	44.999
4	0.02	-0.679	0.679	0.144	-4.89	4.892	7.202	45.002
5	0.03	-0.674	0.675	0.216	-4.855	4.86	7.204	45.004
6	0.036	-0.672	0.673	0.259	-4.842	4.849	7.206	45.006
7	0.04	-0.67	0.671	0.288	-4.828	4.837	7.206	45.006
8	0.042	-0.669	0.67	0.303	-4.821	4.831	7.207	45.007
9	0.044	-0.669	0.67	0.317	-4.822	4.833	7.208	45.008
10	0.044	-0.668	0.669	0.317	-4.816	4.826	7.209	45.009
11	0.056	-0.588	0.591	0.422	-4.427	4.447	7.529	45.329
12	0.046	-0.697	0.699	0.337	-5.112	5.124	7.335	45.135

Node 846								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.14	-0.61	0.626	-0.948	-4.13	4.237	6.77	45.02
2	-0.098	-0.643	0.65	-0.661	-4.339	4.389	6.748	44.998
3	-0.055	-0.645	0.647	-0.371	-4.348	4.364	6.741	44.991
4	-0.02	-0.641	0.641	-0.135	-4.322	4.324	6.742	44.992
5	0.007	-0.635	0.635	0.047	-4.282	4.283	6.744	44.994
6	0.026	-0.628	0.629	0.175	-4.236	4.239	6.745	44.995
7	0.038	-0.622	0.623	0.256	-4.196	4.204	6.746	44.996
8	0.045	-0.616	0.618	0.304	-4.156	4.167	6.746	44.996
9	0.049	-0.612	0.614	0.331	-4.129	4.142	6.747	44.997
10	0.051	-0.609	0.611	0.344	-4.11	4.124	6.748	44.998
11	0.062	-0.494	0.498	0.439	-3.497	3.524	7.078	45.328
12	0.056	-0.64	0.642	0.384	-4.393	4.41	6.864	45.114

Node 852								
Time	X-velocity	Y-velocity	Total	X-unit flow	Y-unit flow	Total	Depth	WSEL
(hours)	(m/s)	(m/s)	(m/s)	(sq.m/s)	(sq.m./s)	(sq.m/s)	(m)	(m)
1	-0.051	-0.782	0.784	-0.493	-7.561	7.577	9.669	45.029
2	-0.044	-0.828	0.829	-0.424	-7.984	7.996	9.643	45.003
3	-0.035	-0.845	0.846	-0.337	-8.142	8.149	9.636	44.996
4	-0.027	-0.856	0.856	-0.26	-8.249	8.253	9.637	44.997
5	-0.02	-0.863	0.863	-0.193	-8.318	8.321	9.639	44.999
6	-0.015	-0.867	0.867	-0.145	-8.358	8.359	9.64	45
7	-0.011	-0.87	0.87	-0.106	-8.388	8.388	9.641	45.001
8	-0.008	-0.871	0.871	-0.077	-8.397	8.398	9.641	45.001
9	-0.006	-0.871	0.871	-0.058	-8.398	8.398	9.642	45.002
10	-0.005	-0.871	0.871	-0.048	-8.399	8.399	9.643	45.003
11	0.005	-0.771	0.771	0.05	-7.686	7.686	9.969	45.329
12	-0.003	-0.902	0.902	-0.029	-8.805	8.805	9.762	45.122

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