Having now established what the width of influence and depth of influence are, it becomes possible to determine if the ship is:

1. In open water conditions?
2. In confined channel conditions?
3. In shallow water conditions?
4. In deep water conditions?

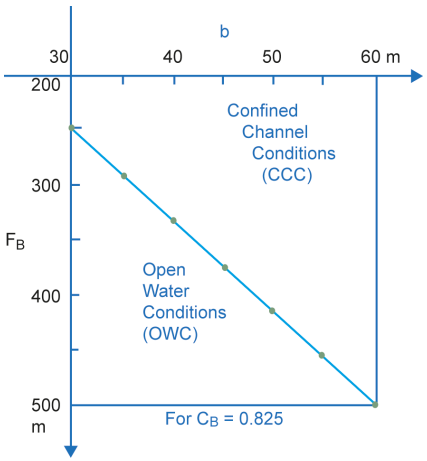


Figure 3.2: Supertanker

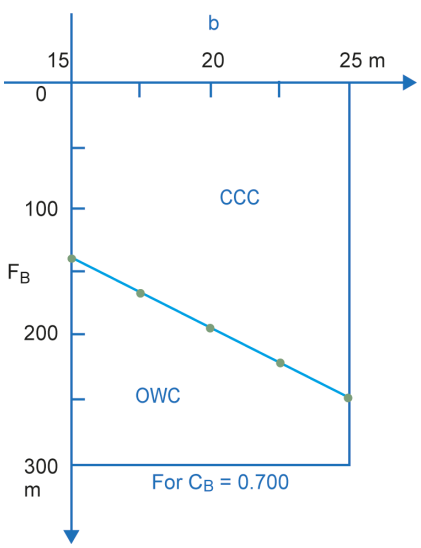


Figure 3.3: General cargo ship

Using the width of influence format, Figures 3.2-6, graphically answer the first two questions.

b = Br Mld of ship in metres
F_B = Width of influence in metres
C_B = Ship's block coefficient

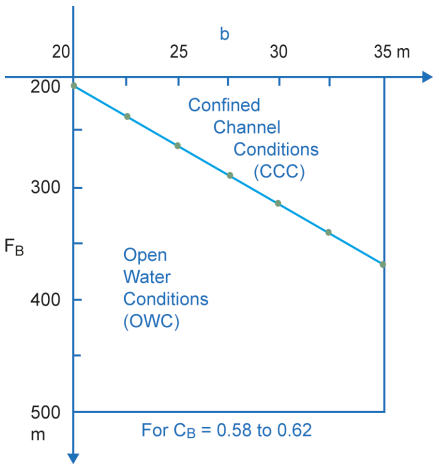


Figure 3.4: Passenger liner

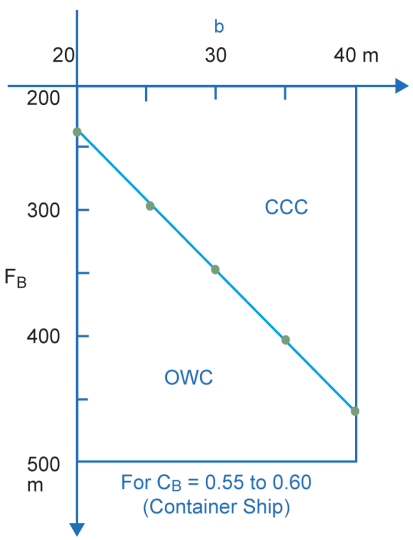


Figure 3.5: Container ship

WIDTHS OF INFLUENCE FOR VARIOUS TYPES OF SHIP

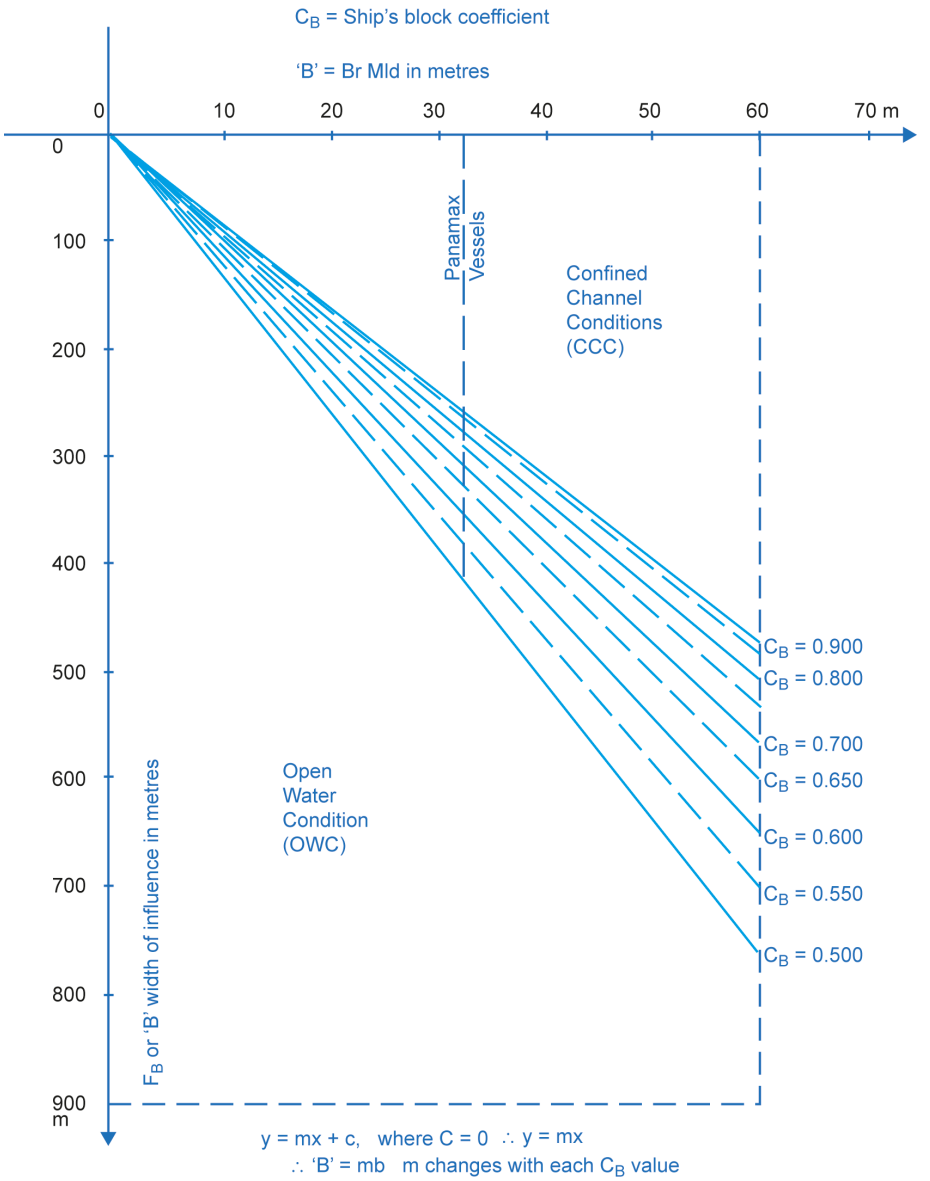


Figure 3.6: Widths of influence for various value of C_B

Note the gradient of line changes with the block coefficient value.

Using the width of influence format, Figures 3.7-11, graphically answer the last two questions.

These findings depend upon the ship type, the Breadth Mld (b) and the block coefficient for each selected vessel.

T = Static even keel draught in metres
F_D = Depth of influence in metres
C_B = Ship's block coefficient

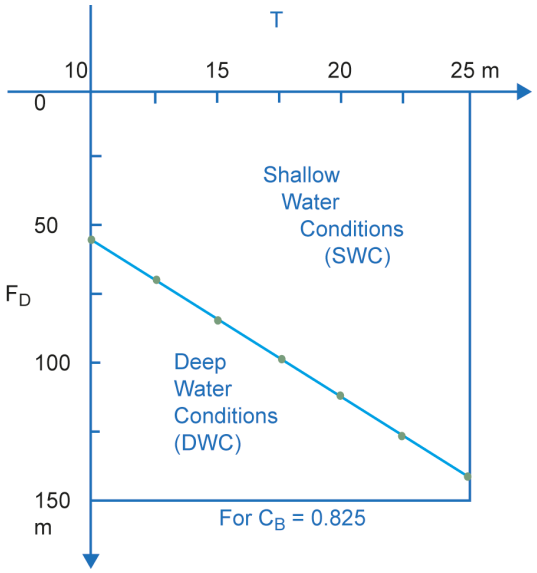


Figure 3.7: Supertanker

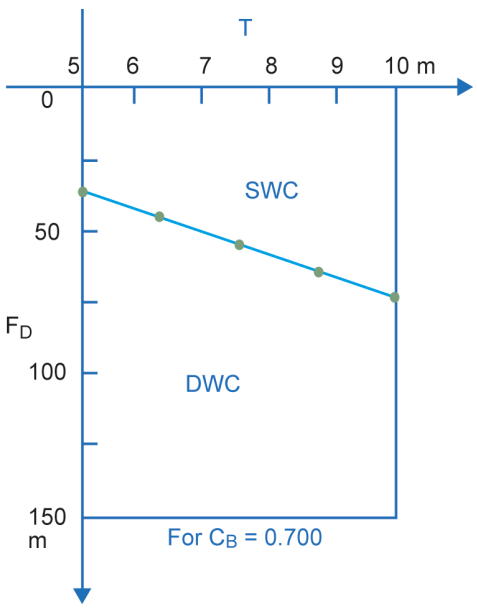


Figure 3.8: General cargo ship

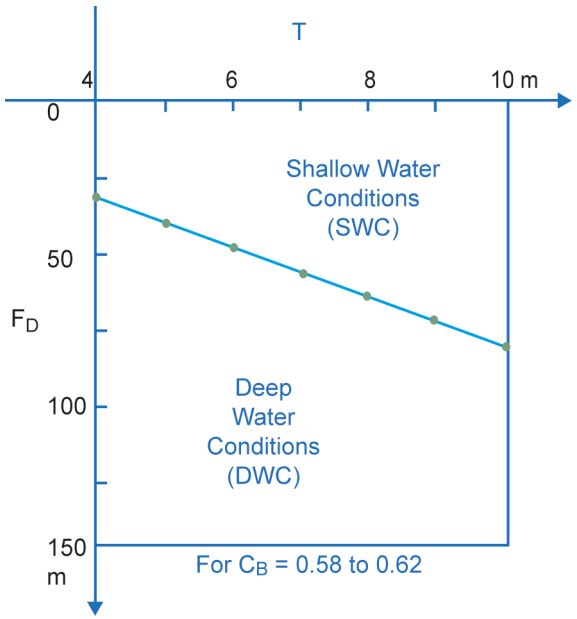


Figure 3.9: Passenger liner

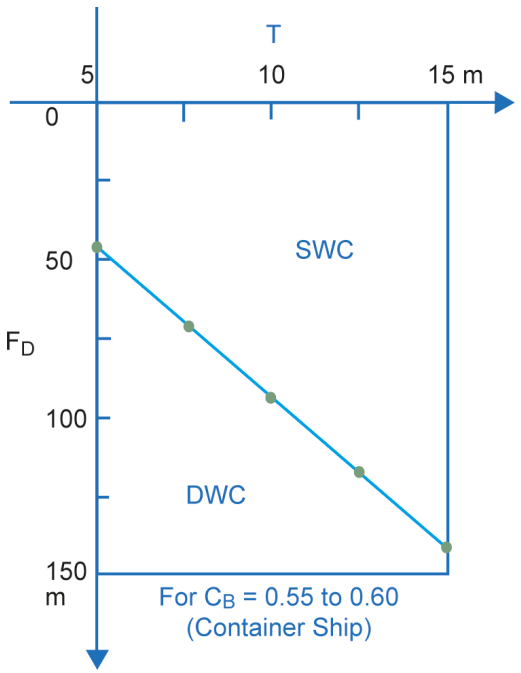


Figure 3.10: Container ship

DEPTHS OF INFLUENCE FOR VARIOUS TYPES OF SHIP

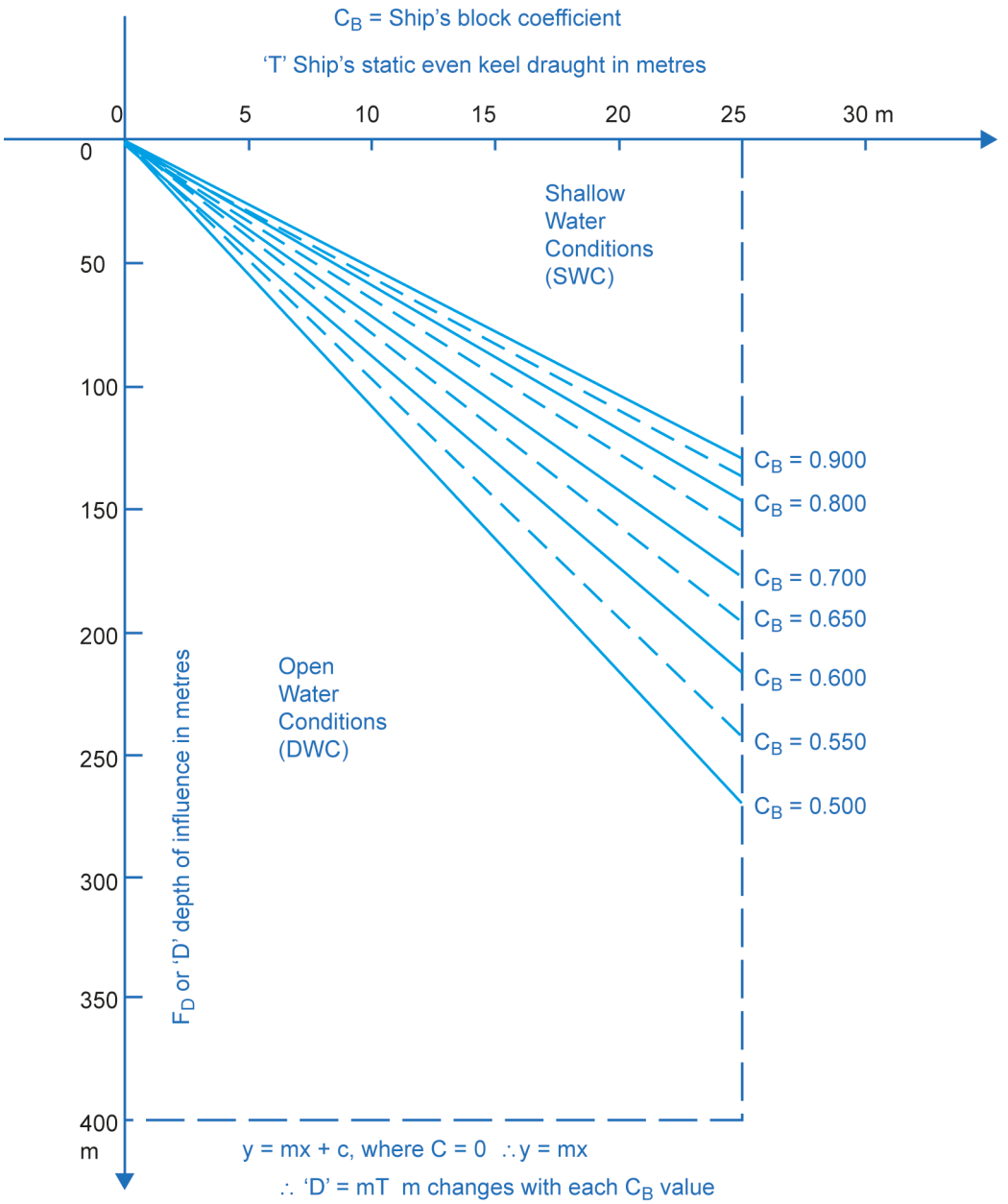


Figure 3.11: Depths of influence for various values of C_B

These findings depend upon the ship type, the Draught T and the block coefficient for each selected vessel.

Photograph 3.1: The Corinth Canal. A unique example of a confined channel.

The Corinth Canal links the Gulf of Corinth in the northwest with the Saronic Gulf in the southeast.

The canal is 3.9 miles in length and has a water depth of 8.0 metres. The canal was completed in 1893.

Photograph 3.1 shows the sides of this canal. Figure 3.12 shows the underwater dimensions with the breadth and draught of a cruise ship that has passed through this canal.

Note: H/T ratio of 1.48.

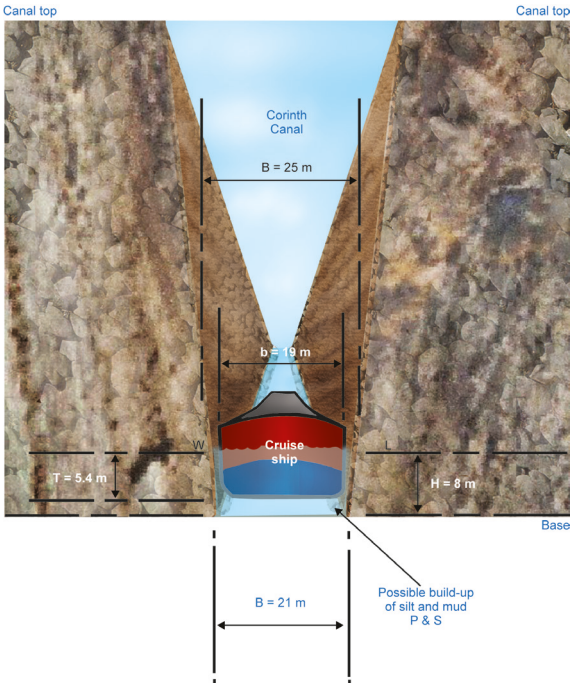


Figure 3.12: A cruise ship in the Corinth Canal. Transit speed was 4 to 5 kts.

Figure 3.13: View from the deck of a cruise ship in the Corinth Canal.

Chapter 4

Effect of Speed

4.1 Ship's Speed V_K in a River having a Tidal Flow or Current

Speed V_K is the ship's speed relative to the water speed.

Measured speed over a known distance.	=	Speed over the ground relative to the water speed.	+/–	Speed of the water.
V_M	=	V_K	+/–	V_W

Hence,

$$V_K = V_M +/- V_W$$

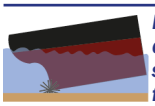
If the direction of flow of the water is *opposite* to the direction of the measured speed of the ship, then the sign is +ve for V_W, ie the relative speed is increased.

If the direction of flow of the water is in the *same direction* of the measured speed of the ship, then the sign is –ve for V_W, ie the relative speed is decreased.

Consider the 5 cases shown in Figures 4.1 to 4.5. In all 5 cases, each velocity profile beneath the ship will have a maximum value V_{MAX} at about half the depth of the underkeel clearance. The greater the area of the velocity profile curve, the greater will be the pressure drop and, therefore, the greater will be the ship's squat.

Case 1 $V_K = V_M + 0$ So $V_K = V_M + 0 = 5$ kts.

Case 2 $V_k = 0 + 5$ So $V_K = 5$ kts.



Figures 4.1 to 4.5 are a series of diagrams providing several cases of ships operating in zero flow, oncoming flow and following flow. These could represent certain conditions of tidal flow in a river or in a canal.

Note that in Case 2 the ship is moored and there is no propeller rpm. Therefore, these 5 kts are equivalent to a forward speed of 5 kts, although the velocity beneath the ship is different to that in Case 1.

V_M = Measured speed over a known distance
V_W = Speed over water or current
V_K = Speed over ground relative to the water

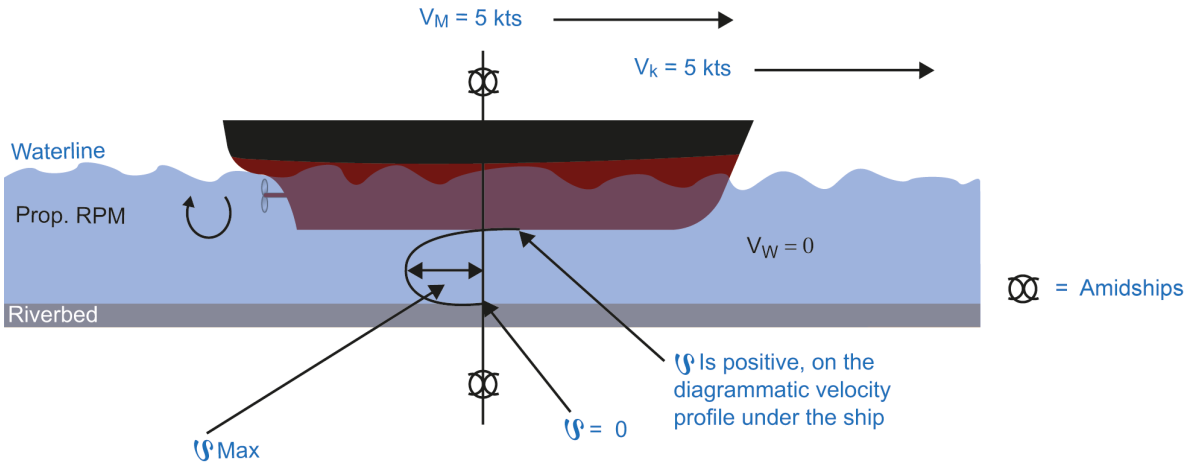


Figure 4.1: Case 1. Velocity of advance, V_K = 5 kts.