3.0 ROBERTS BANK TIDAL FLAT MORPHOLOGY

3.1 CONDITIONS BEFORE PORT DEVELOPMENT

Figures 3-1 and 3-2 show portions of Roberts Bank prior to any substantial marine developments. A distributary channel drained from the main arm of the Fraser River near Ladner and flowed southward through the Tsawwassen First Nations Reserve eventually discharging into the present inter-causeway area near the present marsh.

Figure 3-3 shows a low level photo from 1949 of the upper foreshore near the present causeway. The northwest trending lineations that are visible in the tidal-flat sediments indicate the tidal currents swept across the flats between Canoe Passage and the present location of the BC Ferries terminal. In addition to the lineations, there appears to be a navigation marker on the tidal flats, visible as a white triangle in the centre of the photo, which was causing an accumulation of sediment in the lee of the structure. This sediment accumulation indicates that dominant drainage and sediment transport was from northwest to southeast, across the flats.

Also visible in Figure 3-3 are sub-parallel lineations near the top of the beach running perpendicular to the beach front, indicate the direction of drainage away from the coarser beach sediments at the top of the beach. Behind the beachfront, drainage from the salt marsh creates a more complex pattern of small channels and deposits. In the southwest corner of the photo, deeper grooves indicate that drainage from the tidal flats becomes slightly channelized near the lower limit of the tide.

3.2 PORT DEVELOPMENT

Significant human modification to the tidal flats in the vicinity of Roberts Bank began in 1958 with construction of the BC Ferries Tsawwassen terminal and causeway, which was completed in 1960 (Hemmera, 2003). Construction of the Roberts Bank Coal Port facility began in the early 1960s and was completed in April of 1969. The following detailed description of the construction and upgrade of the two major projects is based on the Hemmera (2003) report and from analysis of airphotos.
DELTA PORT THIRD BERTH PROJECT
COASTAL GEOMORPHOLOGY STUDY

Roberts Bank and Tsawwassen Area, 1900 and 1932

northwest hydraulic consultants
Triton Consultants Ltd.

Notes:
1) Orthophotos georeferenced using ArcView GIS.
2) Crest protection installed in 1981.
3) Current Deltaport structures and BC Ferries structures are shown.
4) Current features based on 2002 orthophotos.
Notes:
1) Orthophoto georeferenced using ArcView GIS.
2) Crest protection installed in 1981.
3) Current Deltaport structures and BC Ferries structures are shown.
4) Current features based on 2002 orthophotos.

PHOTO B - APPROXIMATE SCALE

PHOTO B - 1966

DELTAPORT THIRD BERTH PROJECT
COASTAL GEOMORPHOLOGY STUDY

Airphotos of Roberts Bank,
1950 and 1966

northwest hydraulic consultants
Triton Consultants Ltd.
DELTA PORT THIRD BERTH PROJECT
COASTAL GEOMORPHOLOGY STUDY

Tidal Patterns on Roberts Bank in 1949

northwest hydraulic consultants
Triton Consultants Ltd.

FIGURE 3-3

Notes:
1) Orthophoto georegistered using ArcView GIS.
2) Current Deltaport structures and BC Ferries structures are shown.

NHCV
The BC Ferries Tsawwassen terminal and causeway, completed in 1960, was subsequently upgraded in two separate projects. The initial construction involved dredging a deep trench in the tidal flats south of, and parallel to, the causeway to provide fill material for the causeway and terminal construction. The first expansion of the terminal was completed in 1976 with the construction of three additional berths added to the south-western end of the terminal. The second expansion of the terminal was completed in 1991 with the addition of a new parking area and eelgrass compensation site to the north of the terminal.

Initial construction at Deltaport was completed in 1969. Dredging at that time was limited to the southeast of the facility to provide construction materials. Between 1980 and 1982 the dredged basin was significantly enlarged, both to provide material for the construction of three additional pods (platforms) at the port facility, and to provide a turning basin for large ships accessing the port facilities (Figure 3-4). A crest protection structure was also constructed around the upper rim of the basin to limit drainage channel formation. The causeway was also widened at this time. Subsequent expansion occurred between 1984 and 2001 as the new pods were developed and occupied by the Deltaport container facilities. Between 1995 and 2001, Pod 4 was occupied and included the addition of docking and container facilities on the southeast corner of Pod 4.

3.3 HISTORICAL CHANGES

3.3.1 West Side of Roberts Bank

Figures 3-5 and 3-6 illustrate historical changes on the tidal flats between the mouth of Canoe Passage and the Roberts Bank Causeway. The section of Canoe Passage between Westham Island and Ladner is confined by dikes and the channel’s overall alignment has remained stable over the last 70 years. However, further downstream, the channel spills across the tidal flats and the outlet has experienced considerable channel instability and shifting. The active width of the channel has also varied considerably, and has narrowed appreciably since 1966 due to bar growth at the southern edge of the channel (Figure 3-5). Notable changes have occurred on the upper tidal flats near the present Roberts Bank Causeway, probably in response to construction of the causeway, which modified the drainage paths. The 1966 photo shows a channel draining from the shore, east of the Roberts Bank causeway, progressing southwest to the main drainage
Notes:

DELTA PORT THIRD BERTH PROJECT
COASTAL GEOMORPHOLOGY STUDY

Roberts Bank Port Facilities,
1969 to 2000

northwest hydraulic consultants
Triton Consultants Ltd.

FIGURE 3-4
Notes:
1) Orthophotos georeferenced using ArcView GIS.
2) Current Deltaport structures are shown.

DELTA PORT THIRD BERTH PROJECT
COASTAL GEOMORPHOLOGY STUDY

Historical Photos between
Canoe Pass and Roberts Bank Causeway,
1966 and 1979

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Triton Consultants Ltd.