

**BRIEF INTRODUCITON TO
THE PROJECT OF TONGGU CHANNEL**

Shenzhen Port Tonggu Channel Developing Office

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1. Basic Information

1.1 Name of the Project

Tonggu Channel of Shenzhen Port

1.2 Objective and property of the Project

Shenzhen Port is one of the coastal hub ports in mainland China. Its Western part, Western Port, constituting Shekou, Chi Wan and Ma Wan Terminals, enjoys a scale of 85 berths after more than 20-year development. In recent years the Western Port saw rapid increase in its cargo throughput and in 2002 the cargo throughput reached 56,970,000 tons.

At present all vessels to access the Western Port must go through HK Mawan Waterway. However, with rapid flows, submerged rock and burbles in Mawan Waterway as well as stark turnaround of 90°, it is difficult to operate the vessels and ensure the safety. Due to rapid increase of cargo throughput in the Western Port, Mawan Waterway can hardly meet the demand of Western Port's development. Therefore, Tonggu Channel is proposed to relieve the pressure of Mawan Waterway and stimulate further development of the Western Port.

In addition container transportation in the Western Port developed quickly. The tendency of larger container vessels will need deepwater berths and development of new deep passage to access the outer sea thus ensuring container vessels enter or exit the Western Port at any time. In the meantime development of Tonggu Channel can relieve the pressure on HK and contribute positively to the stability of HK's shipping market, growth of economy of HK and Shenzhen and prosperity of HK.

1.3 Proposer of the Project

Shenzhen Port Tonggu Channel Developing Office

1.4 Location, Scale and Location History of the Project

1.4.1 Location of the Project

Shenzhen Tonggu channel project is one of the biggest striding borderline capital construction corresponding project between Shenzhen and Hong Kong. Starting at the mouth of Shenzhen Bay and ending at Dayushan Southwest waters, Tonggu Channel is 20.2km long in total and there is about 4.5km in the region of Hong Kong. Out of it, 18km-long channel shall be dredged and directs from northeast to southwest, as shown in Table 1-1. Tonggu Channel links with Anshidun Waterway at the north and with Dahao Passage at the south. It is another deep depth channel to get to the sea outside and the tie for the Western Port to connect large waterways of the Pearl River Estuary.

1.4.2 Scale of Project

The scale of Tonggu Channel varies in its short-term, medium-term and long-term options (as shown in Table 1-1). For the short-term option, 4G container vessels can pass all the day and the channel is unidirectional; for the medium-term option, 5G container vessels can pass all the day and the channel is unidirectional; for the long-term option, 6G container vessels can pass all the day and the channel is bi-directional.

Table 1-1 Scale and main dimensions of Tonggu Channel

| Option | Typical vessels | Dredging length (km) | Effective width (m) | Designed draft (m) | Dredging volume ('000m ³) | Volume dropped to the land ('000m ³) | Volume dropped to waters ('000m ³) | Construction time |
|-------------|----------------------|----------------------|---------------------|--------------------|---------------------------------------|--|--|-----------------------|
| Short-term | 4G container vessels | 18.0 | 200 | -13.5 | 32,820 | 15,320 | 17,500 | At the end of 2003 |
| Medium-term | 5G container vessels | 18.6 | 215 | -15.7 | 48,530 | 32,030 | 17,500 | 2008 |
| Long-term | 6G container vessels | 19.2 | 455 | -17.0 | 102,360 | 84,860 | 17,500 | Building if necessary |

1.4.3 Location History

Tonggu Waters where the Project is developed is to the east of External Ling Ding Yang of the Pearl River Estuary. To the north, east and south of it are respectively Internal Ling Ding Island, Qingshan Island and Dayu hill. Further out of the Estuary are the multi-layer barrier formed by many islands that are the extension of the Coastal Mountain of Guangdong Lotus Hill covering small area and constituted by granite. With sloping hillside and little plain land, the hill and island alternate. At the Pearl River Estuary the East-West Waterway, Daxi Passage and Dahao Waterway collect. In addition there exists international anchorage area closely linking the Pearl River and South China Sea. So the location is strategically important.

Generally speaking, the bathymetric pattern of Tonggu Waters is “one beach and two shores” directing south to north. “One channel” refers to the southern part of Fanshi shallow beach including Southern beach of Internal Ling Ding Yang, southeastern division of Fanshi shallow beach and Chili shallow beach which are normally less than 5m deep and composed of silt and silty soil of more than 10m thick. “Two shores” refer to 1.5~2km wide and 8~17m deep Western Shore of Ling Ding Yang (Ling Ding Waterway) and 2~2.5km wide and 20m deep Eastern Shore of Ling Ding Yang (Anshidun Waterway extended from Fanshi Waterway). In addition between Fanshi Shallow Beach and Anshidun Waterway there are Tonggu Island, Baipai Island, Shazhou Island and shallow beaches nearby. To the north of Dayu hill, to the north of Tonggu Island and to the east of Internal Ling Ding Island respectively lie

sub-level tide passage and embedded shores 5~6m deep. Tonggu Channel is located at the shallow beach directing southwest and close to Tonggu Island. It connects Anshidun Waterway and Dahao Passage.

1.5 Work Items and Category of the Project

In the short-term, medium-term and long-term the dredging volume of Tonggu Channel is respectively 32.82mill, 49.53mill and 102.36mill m³, the dredging volume of the part in Hong Kong of the several term project is shown in Table 1-2. In the Pre-feasibility Report of the Project, it is recommended to drop the dredged substances on the land and into the waters. It is planned to drop about 17.5mill m³ substances into the waters of C zone (as shown in Graph 1-2) and the left part onto the land.

This brief to the channel project mainly discusses the effect of the part of the channel project in the range of Hong Kong and the water dumping and the land dumping to the environment of Hong Kong. According to the provision of the “Environmental Impact Assessment Ordinance” of Hong Kong, this project belongs to the category c.12. The nearest distance from water dumping area to Hong Kong water area is about km, from the land dumping area, the Dachanwan Nanyou dumping area to Hong Kong area is about km(the location of the dumping area is shown in Graph 1-2).

Table 1-2 the dredging volume of Tonggu Channel in the short-term, medium-term in the range of Hong Kong

| Construction moment | Dredging distance in Hong Kong(m) | Dredging volume in Hong Kong(thousand m ³) |
|-----------------------------|-----------------------------------|--|
| The short-term engineering | 3510 | 8120 |
| The medium-term engineering | 3830 | 2380 |

When pre-feasibility study was conducted, three routing options are studied for Tonggu Channel, i.e. western routing, mid routing and eastern routing. Subsequently with further study at the first meeting of the marine channel expert panel under the HK and Mainland Coordination Committee of Large Infrastructure Projects experts of both sides thought that the option of Eastern Routing is within the forbidden zone of HK airport and conflicts with the safety needs, so simply only the options of Western Routing and Mid Routing are left for comparison.

According to the figures of geologic investigation, seismic survey and hydrometrical measurement and in line with the principle of minimizing workload and impacts on other relevant projects, the feasibility study results in adjusting the central line of the Western and Mid Routing options and presents comparison (shown in Table 1-3) shows, the option of Western Routing features minor cross currents, small angle when connecting with Anshidun waterway, better conditions for shipping, 0~I class soils easy to dredge, clearer geologic conditions and more space for further development, avoiding the conflict of constructing in the range of Shazhou and Longguzhou marine park, thus generally a better option. For the Mid Routing Option, despite less workload it is necessary to explode submerged rocks for dredging and construction is more difficult. Especially it is conflicting with the marine park

and the Indo- pacific hump-backed dolphin marine reserve of HK. So the Western Routing Option has been adopted.

Table 1-3 Comprehensive comparison of Western Routing and Mid Routing for Tonggu Channel

| Items for comparison | Western Routing | Mid Routing |
|---|-----------------|---|
| Length of manually dredged channel (m) | 18000 | 15430 |
| Angle with conventional wind direction | 68? | 61? |
| Angle with conventional tide direction | 22? | 29? |
| Maximum velocity of cross current (m/s) | 0.28 | 0.43 |
| Angle with Anshidun Waterway | 20? | 41? |
| Dredging volume in the short term ('000m ³) | 32,820 | 31,730 |
| Conditions of dredging | Relatively good | Poorer |
| Dredging volume of maintenance ('000m ³) | 1,300 | 1,200 |
| Medium-term and Long-term development | More space | Explosion of submerged rocks is necessary |
| Estimated short-term investment (RMB'000) | 951,650 | 842,170 |

1.6 Contact Persons and Their Telephones:

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2 Brief Planning and its Execution

2.1 Planning and Execution of the Project

Consultants are appointed to undertake geo-technical investigation, hydrometric measurement, tidal and silt modeling test, selection and planning of temporary dumping zone, assessment of environmental impacts, selection and planning of land dumping area and feasibility study. It is suggested to appoint a consultant to commence initial design, detailed design and supervise the construction.

2.2 Time Table of the Development of Tonggu Channel

According to the present work program, a consultant is to be appointed in April, 2003 to undertake the environmental impact assessment according to HK "Environmental Impact Assessment Ordinance". It is expected to commence the construction by the end of 2003 and put the Channel into operation by 2005.

2.3 Cooperation of Other Relevant Projects

- (1) As a supplementary structure, navigation marks are to be developed.
- (2) Anchorage area is to be developed near Guishan Island waters.

3 Potential impacts brought by the Project

3.1 Introduce of the construction technology

Large-scale drag-suction dredgers are employed to excavate Tonggu Channel, for it is widely used for dredging on extensive waters. Drag-suction dredgers domestically designed and made reach the international standard of similar ships. Table 3-2 lists the major performance indicators of drag-suction dredgers to be used in the project. The work procedure of drag-suction dredgers is: movement with no load → dredger positioned and run the scraper → dredger fully loaded → dredger moves to the dumping area and drops the soils → return to the dredging area.

Table 3-1 Main technical parameters of the drag-suction dredgers

| Dredged length | Length of the dredger | Beam of the dredger | Draft | Capacity | Velocity |
|----------------|-----------------------|---------------------|-------|--------------------|----------|
| 20m | 107m | 18.4m | 7.2m | 4500m ³ | 13kn |

For dumping into waters, large-scale drag-suction dredgers are employed to transport the dredged soils to specified position and then dump them .

For dumping onto the land, it is necessary to build a bund around the dumping area. When the drag-suction dredger moves the soils to the dumping position, soil-discharging pipes are placed on the barges there. Then the equipment on the dredger directly puffs the soils into the bund. When the distance is too far, a pump is needed to add the pressure.

3.2 Potential Impacts on the Environment

3.2.1 Analysis of Advancement of the Technology

3.2.1.1 Operation of drag-suction dredgers

The sucker at two sides of the dredger are connected with soil-sucking pipes and pump and soils are pressed into the cabin by vacuum pressure. When soils enter the cabin, heavier substances drop to the bottom of the cabin. When the quantity of soils exceed overflowing point, thinner substances would overflow. When the density of absorbed soils is the same as that of overflowing soils, a device on the cabin indicates that the cabin is fully loaded.

3.2.1.2 Analysis of advancement of the technology

The 4500m³ large-scale drag-suction dredger features sound performance and perfectly accommodates to dredging works of exit channels. It is an extensively used advanced equipment in the world. Advanced large-scale drag-suction dredgers are equipped with positioning system and shipping

recorder and can ensure accuracy of dredging and dumping, thus providing better conditions to take relevant measures to protect the environment. In addition advanced dredgers are usually equipped with auto overflow-controlled system which automatically closes the overflowing door. With highly accurate response, the dredged soils would scarcely overflow in the course of carriage and transportation.

When dumping the soils onto the land, to prevent watery soils from flowing into the sea a bund high and strong enough must be developed around the dumping area so that the soils can be separated from the surrounding waters and the discharged watery soils can sediment in the dumping area for relatively long time before discharged, thus minimizing impacts on the environment. Compared with the option of dumping soils into the waters, dumping soils onto the land brings relatively less impacts on the oceanic environment. For the Project of Tonggu Channel, most of the dredged soils are dumped into the Dachan Bay Nanyou dumping area. Making use of the soils as valuable resources can not only lessen pollution to the oceanic environment but minimize the impacts of filling the sea with soils from excavated mountain on environment. In line with the national standard, development of Tonggu Channel will maximize dumping onto the land and minimize dumping into the waters.

Generally speaking the technology used in dredging, transportation, dumping and filling is advanced home and abroad and favorable to lessen discharge of pollutants in the course of construction and operation.

3.2.2 Recognition and Selection of Polluting Elements

During the course of constructing the Channel, dredging, dumping soils into the waters and onto the land are likely to impose certain impacts on the environment. According to experience of similar projects, the pollutants are mainly suspended materials, heavy metal and petro-elements.

Table 3-2 Recognition and selection of pollutants

| Work item | Pollutants | Influenced elements |
|-------------------------------|---|--|
| Dredging | Suspended materials, heavy metal and petro-elements | Water quality and lives in the sea near the project location |
| Dumping soils into the waters | Suspended materials, heavy metal and petro-elements | Water quality and lives in the sea near the project location |
| Dumping soils onto the land | Suspended materials, heavy metal and petro-elements | Water quality and lives in the sea near the project location |

3.2.3 Analysis of Pollutants

Soils and sands generated in the course of construction shall be carried and moved by ships to selected waters or land for treatment. When they are dumped into the waters, due to the mixture force of tides a lot of suspended materials are generated and certain pollutants are discharged, thus bringing impacts on the environment. When they are dumped onto the land, waters containing dense suspended materials flow into the waters even after sedimentation. According to the figures of similar projects, the discharging parameters of various pollutants when adopting 4500m² dredgers are shown in Table 3-3.

Table 3-3 Discharging parameters of main pollutants of Tonggu Channel

| Polluting source | Pollutants | Polluting level | Remarks |
|-----------------------------------|--|---|---|
| Dredging | Suspended materials and pollutants discharged from the soils | Density of the suspended materials 20m away from the dredging position is about 700~1000mg/L. | The polluting level of pollutants discharged from the dredged soils is decided by the results of dissolution tests. |
| Dumping soils to the waters | | About 1%~5% of the dumped soils becomes suspended materials. | |
| Dumping soils to the land | | About 2%~5% of the overflowed soils becomes suspended materials. | |
| Drainage of the soil-digging ship | Oil pollutants from the cabin | 1000tons/year*ship | Treated by oil-water separator before discharging to the sea |
| | Living sewage | 12tons/day*ship | Directly discharge to the sea |
| | Solid pollutants | 40kg/day*ship | Carried by waste ships to waste treatment station |

3.3 Impacts to the Environmental of the Engineering

In the period of construction and operation of the engineering, the impacts to the environment nearby include the effect to the water environment, zoology, rubbish and noises.

3.3.1 Impacts on the waters

In the period of construction and operation, the following factors will affect the water environment in Hong Kong.

- (1) change of the status of the landform in the sea bottom caused by the dredging engineering
- (2) suspended materials caused by the dredging engineering
- (3) the harmful materials emitted by the suspended materials caused by the dredging engineering
- (4) in the period of operation, the suspended materials and the harmful materials emitted by the suspended materials caused by the dredging engineering

According to the feasibility report prepared by the consultant, the annual sedimentation volume is about 1~1.3mill m³ after Tonggu Channel is put into operation. Such sedimentation shall be dredged as maintenance, which will also raise some environmental impacts subject to 2 factors: source level discharged by the suspended materials and water conditions.

- (5) the process when dredged soils are transported
- (6) operation staff pollution waters
- (7) the land dumping dredging soil
- (8) the sea dumping dredging soil

3.3.2 Zoology Environment

It will be discussed and studied in the following research.

- (1) Impacts of the project on the fishing resources of HK

According to the width and length of the part in Hong Kong of the channel, and the type of the bottom area, water environment, biology constitute, the status of the water quality, the feasibility of the habitat, and the environment condition, the construction will affect the fishing resources directly or indirectly.

- (2) Upon operation of Tonggu Channel with increasing vessels, the fishing resources and the species and density of marine organism in the water area nearby will be affected directly or indirectly.

- (3) Impacts of dumping into the water on the fishing resources of Hong Kong
the dumping of the dredging soil will lead that the portion of suspended solid materials in the water exceedingly high, silts easily gather at the branchia of the fish, thus worsening their filtrating and respiration functions or even dying due to suffocation.

The suspended grains in the water would attach to the surface of the fish eggs, affecting respiration of the eggs and exchange of oxygen and CO₂ in the water. As far as the present knowledge goes, some fish eggs can hardly endure the waters of 1000mg/L of the suspended materials. In addition the exceedingly high density of suspended materials will lessen the breeding speed of the fish. For some fish the limit is 75~100mg/L. If this limit is exceeded, the breeding speed is obviously slowed. In the Pearl River waters higher density of fish eggs exists, so negative impacts are brought if soils are dumped here.

Fishes and other marine organism can better adjust to slowly changing environment, but not the suddenly changed environment. In the course of dumping, the suspended materials will disturb the water, thus making the fishes to shy away. Most fishes favor clear water. When they shy away from the polluted waters, their swimming route is changed, which is called “dispersion activity” in the fishing filed. This activity will inevitably bring two consequences: firstly in the breeding season the fish group that generates eggs here will leave on different route; secondly the distribution and swimming regulations of fishes living here are disturbed.

The consequences can be summarized to be that the fish farming filed changes. In natural condition the fish field or the central field will change regularly. But experienced fishermen can grasp the regulations of their movement according to such factors of season, wind and tides. But manual dumping would change the movement of the fish. Thus it is hard for the fishermen to grasp their

movement regulations, thus less fishing harvest. It is estimated that the impacts extends to waters of about 10 times of the dredged area.

Because the distance from the land dumping area and the sea dumping area to the water area of HK are 15km and 22.5km away, so we will discuss and study the effect to the fishing resources of Hong Kong in the following research.

(4) Analysis of impacts on farming fields and valuable protected aquatic animals of HK

Because the engineering may affect the breeding area and the fry area of Dayu hill, Nandayu hill, Nanzhangzhou, Nanya island and the Indo- pacific hump-backed dolphin marine park in Changzhou and Longguzhou, so in the following research include the research to the dredging and dumping of the dredging soil, the research to the location of the dumping area, the effect extension of the muddy water. we will discuss and study the effect to the species in HK water area. In addition movement of vessels and dumping may make these valuable animals swim away. After the project is finalized, it is likely to change the swimming route of these animals due to changes in bathymetric pattern, which is not concluded.

3.3.3 Rubbish

(1) In the period of construction, some rubbish will be produced by the operating vessels.

(2) In the period of dumping the dredging soil onto the land.

3.3.4 noises

in the following research, we will discuss and study effect of the noises made by the operating vessels and the machine to the biology.

4 Main elements of the surrounding environment

Main elements within the environment of the project are shown in Graph 4-1, including:

- (1) Protective zone of parr and young shrimps within -20m bathymetric line of Outer Ling Ding Yang and Wanshan Island group. Border of this zone is at least 5km away from the side of C Zone.
- (2) Breeding and Growth Protective zone of Economic Fishes inward the line of Qiao Island, Inner Ling Ding Island and Chiwan;
- (3) Spawning migration area of Chinese prawns near Inner Ling Ding Island and Dayu Hill
- (4) Oyster farming filed at Dahcan Island, Qianhai and Inner Ling Ding Island and marine farms at Niutou Island, Guishan Island, Dawanshan Island, Outer Ling Ding Island, Dongao Island and Qingzhou Bay
- (5) Protective zone of Indo- pacific hump-backed dolphin marked by HK government near Tonggu Island and Shazhou.
- (6) Fishing resources

According to statistics of relevant institutes, there are about 200 types of fishes, 35 types of shrimps and 40 types of shells.

(6.1) Fish

In recent years 154 types of fishes are recorded within the waters of 22°12'~22°45' and 153 types are identified to belong to 97 categories, 57 sections and 15 items. Main economic fish frequenting this waters are herring, Silvery pomfret and other 42 categories. Among the fish harvest, about 30% of the weight is fish of Sciaedae and 12% is the fish of Clupeidae.

(6.2) Shrimps

According to the results of repeated research, there are 7 items, 17 sections and 35 categories of fish living in the subject sea. In terms of their weight, Palaemonidae, Parapenaeopsis and Metapenaeus account a larger portion.

Main economic shrimps in the waters include *Penaeus merguensis*, *Penaeus orientalis* Kishinouye, *Parapenaeopsis hungerfordi* and other 11 categories. With calculation of the research data, the fish density in the waters is about 45kg/km² and in C Zone the density of shrimps is 0.109t/km².

(6.3) Shells

Shells are the main fishing resources in the subject waters. According to the research data, more than 40 categories of shells are identified to live in the waters. The Western of Dayu Island divides the waters into East Zone and West Zone. In the West Zone the amount of organism is 43.1g/m² on average and living density is 39/m². In the East Zone the average amount of organism is 6.98g/m² and the living density is 23ind/m².

In the West Zone *Turritella bacillum keener* and *Aloidis laevis* is the major economic categories. The annual harvest of *Turritella bacillum keener* is more than 1000tons while that of *Aloidis laevis* is about 500tons. In the East Zone *Mabellarca consociata*, *Potamocorbula* and *Bolma girgylla* dominate.

In C Zone the shell resources are rich. The average amount of organism is 8~10g/m² and living density is 23ind/m².

(6.4) Protection of breeding of the fishing resources

Ling Ding Yang of the Pearl River Estuary is the main field for spawning and growth of young fish and shrimps. Besides the local fishes and shrimps, a large amount of oceanic fishes move to this waters for spawning and food seeking. In the waters to the north of Inner Ling Ding Island and Qiao Island natural eggs are densest, then comes next the waters to the south of Inner Ling Ding Island, Tonggu Zhou, the Western Dayu Hill and Guishan Island. The waters in question is important fishing fields, especially the major field of *Penaeus (Fenneropenaeus) orientalis* Kishinouye. Table 4-1 lists the spawning field and period of main economic categories.

| Category | Spawning period (m) | Coverage of the spawning |
|----------------------------|---------------------|--|
| <i>Sardinella nymphaea</i> | April ~ September | 30~60m deep waters of more than 30 salty level |
| Belenger`s croaker | May ~ July | 15~30m deep salty waters of more than 30 salty level |
| Dark pomfret | April ~ July | Between Aizhou Island and Dangan Islands, 15~30m deep waters |
| Black pomfret | May ~ August | Between Northern Dangan Isalnds and Zhizhou Island, 17~30m deep waters |

| | | |
|-----------------------------------|-----------------------------------|---|
| Indo-pacific king mackerel | April ~June | Between Southern Wanshan Islands and Aizhou Island, 20~30m deep waters |
| Large yellow croaker | October ~ February of next year | Between Guishan Island, Zhizhou Island and Aizhou Island, 8~18m deep waters |
| <i>Pennahia argentatus</i> | April ~ August | 15~30m deep water |
| <i>Trichiurus ha umela</i> | April ~ October | 10~30m deep water |
| <i>Psenopsis anomala</i> | January ~ August | 20~40m deep water |
| Yellow Sardinella | January ~ April | 30~50m deep water |
| <i>Upeneus sulphureus</i> | June ~ August | 30~60m deep water |
| Lizardfish, <i>Saurida tumbil</i> | June ~ August | 21~87m deep water |
| Brushtooth lizardfish | June ~ October | 18~114m deep water |
| Whitetipped mackerel scad | February ~ May | 22~60m deep water |
| Chinese herring | April ~ September | Waters to the south of Outer Ling Ding Island, 20m deep water |
| Golden scad | May ~ August | Waters to the north of Dangan Islands and Wanshan Islands, 4~15 deep water |
| Silvery pomfret | August ~ October, January ~ April | Waters to the north of Wanshan Islands, Aizhou Islands and Dangan Islands, 4~15m deep water |
| <i>Priacanthus tayenus</i> | Mar ~ July | 26~80m deep water |

(6.5) Valuable protected animals

In the subject waters Indo- pacific hump-backed dolphin and bahaba flavolabiata shall be protected. The latter mainly moves in the waters to the north of Dachan Island.

Indo- pacific hump-backed dolphin frequents along the Pearl River Estuary, especially the east coast and the area covered is about 600km². Tonggu Island and Sha Island to the east of the project location are specified as a protective zone of indo- pacific hump-backed dolphin by HK government. The waters crossed by the project are the center of the planned protection zone of Indo-pacific hump-backed dolphin. With estimation an area of about 90km² would be affected by the project. However, not many Indo- pacific hump-backed dolphins wonder about in C Zone. According to research in 1998, there are about 1000 dolphins in Pearl River waters. Observation shows that dolphins most frequently appear between 10:00 to 14:00 in June, July and January.

(7) the primary elements and the sensitive biology

The marine park in Shazhou Longguzhou and the planning Nanya island and South-western Dayu hill, the breeding zone and the fry zone in the east-western Dayu hill and Nanzhangzhou and Naya Island, the water fetching zone of the Qingshan power house in Lanjiaozui, the places where have the special scientific value in Houhai Bay, the Lamuloner everglade of Houhai

Bay in Mibu and others sensitive biology which be confirmed in the research are all concluded. The primary elements and the sensitive biology will be confirmed by the environment consultant institution in HK.

The relationship of elements above and the water dumping area is shown in Graph 1-2.

5 Planned Measures to Protect the Environment

5.1 Measures taken to protect the environment in the course of dredging

5.1.1 Advanced technology and clean production equipments

(1) The drag-suction dredgers used for this project are equipped with advanced positioning system, shipping recorder and auto-controlled overflow door to ensure dredging and dumping at a right place and that the overflow door will automatically close when the cabin is full, thus preventing leakage of soils in the course of loading and transportation.

(2) Try to dump as many soils onto the land as possible and minimize soils dumped into the water. In the feasibility report, the dredged soils are to be dumped to both the land and water. It is planned to dump about 18.35mill m³ soils onto the land and 17.5mill m³ into the water. Undoubtedly dumping into the water will create much more impacts on the environment than dumping onto the land. In addition considering the commercial and social benefits of land reclamation, dumping onto the land is economically no worse than dumping into the water. So the dredged soils of Tonggu Channel are most utilized for land reclamation, on one way lessening negative impacts on the oceanic environment, destruction to hills and land erosion. It is suggested to dump as many soils onto the land as possible through reasonable planning and multi-party coordination, so that the project will bring more economic and social benefits.

5.1.2 Environment-protective Measures in the course of dredging and transportation

(1) Reinforce training of operation skills and environment protective measures to ensure correct operation of the dredgers. Work out and implement the training program and raise their attention not to disperse the soils. Suck the sediment when the water is of high density to ensure work efficiency and minimum turbulence to the water and bottom.

(2) Correctly control the moment of overflowing to minimize the amount of soils entering the sea. According to the characteristics of bottom materials, the soils are automatically controlled to overflow at the right moment and so is their density. Try best to minimize soils entering the sea and impacts of turbulence.

(3) Correctly connect the dragger pipe and the dredger itself: The dredger usually sucks soils into its cabin through vacuum. Before connecting the pipe with the cabin, a trial test shall be conducted to see if the pipe is properly connected. The trial test lasts as short as possible and ensure accurate connection of the pipe and the cabin to prevent soils from leaking into the sea.

(4) Measures shall be taken in poor weather to prevent the soils from leaking in the course of transportation. When the wind is of Class 6 or above, dredging and dumping

shall be stopped. Initial analysis shows that about 15 days in a year the dredgers are affected by the weather.

(5) Dredgers shall be maintained regularly to ensure the tightness of the cabin. The cabin door shall be closed promptly after loading the soils to prevent leakage.

5.1.3 Environment-protective Measures when treating the waste water and solid wastes

Appropriate measures shall be taken to protect the environment according to the construction location and the environmental status. Strictly follow up *Discharging Standard of Pollutants of Ships*. The liquid waste containing oils shall be treated by oil-water splitter before discharged to open sea. Generate minimum living waste. Collect and move the solid waste onto the land for treatment.

5.2 Environmental Protection Procedures during the Land Dumping Processes

(1) Before reclaiming the land, a bund high and strong enough shall be built around the land to prevent dredged soils from flowing into the water. Reclamation works shall commence after the bund is over the water. The bund shall be designed strong enough and reverse filter is strong enough to avoid the soils overflowing.

(2) The soils are used for reclamation directly after dredged. In order to decrease pollution and sedimentation, the soils shall be directly dumped by dredgers after dredging rather than employing cutter suction dredgers to dump the soils after dredging.

(3) Properly locate the overflow mouth so that the discharged waters can sediment for enough time. The overflow mouth of the Dachan Bay dumping area is located in the waters faraway from the farming fields and where the water is deep and materials are easy to disperse. The overflow mouth shall be as far as possible from the construction site so that enough time is left for soils to sediment and become clear. The density of the suspended materials shall meet up to the national standard. If the suspended materials are not clear enough for discharge, it is suggested to take measures to reinforce sedimentation and filtering.

(4) Reinforce management of the production to prevent soils from leaking. Set up a mechanism to regularly check and maintain the soil discharging pipes, dredger and their joint. Once the pipe is broken or connection is poor, construction shall be stopped immediately for remedy, so that the accident of overflow is prevented.

(5) Reinforce measures to prevent accidents. In the case of storm tide, typhoon or rainstorm, safety measures shall be taken in advance. Strengthen the overflow mouth so that it is strong enough to resist the storm.

5.3 Environmental Protection Procedures during the Dumping Processes

1) Use modern equipment and record the data of navigation to ensure the dumping in a right area. The testing result shows dumping in the right and accurate position is effective to prevent the pollution of the Marine area. Therefore, all dredging ships must carry with the modern and all necessary equipment, and the data of navigation must submit to the relevant government authorities, and the relevant authorities responsible the supervision and management of dumping.

- 2) Seeking the dumping during falling tide. Plan the dumping and operation carefully and seriously and seeking to complete the dumping within the falling tide period, in order to minimize the negative impact to the Pearl River month.
- 3) Put clear signage around the dumping area, to avoid any accident. The channels from DaWu Bay in Zhuhai to Manila and from Jiuzhou port – Shanghai – Dalian – Haishanwei both are get through the zone C. In order to ensure the safety and reasonable operation have to put clear signage around the selected dumping area, it can help the ships to going in and out the dumping area, further avoid any unnecessary accident due to safety and pollution. In the meantime according to the rules to issue a notice of navigation, prepare the relative coordination works to ensure the safety navigation for going in and out the Pearl River month.
- 4) The dredging ships have to close the gate immediately after dumped the materials, and ensure that the gate was closed in order before leaving. Otherwise, it will pollute the marine area during its return trip. In the meantime, should enhance the communication with the local Weather Station, if under the bad weather condition, should prepare the necessary protection in advance or even stop the dumping works.

5.4 The protection policy during the operation of ship channel

Tonggu Channel will help the development of Shenzhen Western Ports, and the frequent of vessels would be increased greatly, and it will create more pollution including the pollution water emitted by the vessels and the suspended materials increasing because of the operation dredging to the marine area. We will discuss and study the disadvantageous effect to the sea environment caused by reducing the channel project in the period of channel operation.

5.5 The supervision and management plan on environmental protection

5.5.1 Supervision Plan

1) Supervision Station

According to the planning of construction, and the environment sensitive points around Pearl River month and the following research result of environmental assessment, suggested to set up the supervision station at the following sites in order to supervisor the water quality:

Along with the channel: 3 stations, located at north, middle and south of the channel

Land dumping area: 3 stations, located at the tide month of Dachan bay and surrounding area

Sea dumping area: 4 stations, located within zone C dumping area and 4 the angles of this area

Environment sensitive points: 3 stations, located within HK sea area, Inside Ling Ding Island and GuiShan Island

2) Supervision of pollution project

During the construction of Tonggu Channel, the main pollution to the water environment is due to the suspended materials produced during the dredging, dumping and reclamation, while during the operation period, it due to the maintenance dredging. Therefore the unit to be analysis by the supervision station should be suspended materials.

3) The duration and frequent of supervision

During the construction and operation period, daily supervision test should be 1 time per month, and whole day per testing. Each station would undertakes one testing in the flood tide and one testing in the falling tide, and getting the samples from top, middle and deep levels individually. Beside this arrangement, should undertake the testing during the dry, wet and medium seasons. Further, should cross checking the results of each individual testing. Further, each year should assign the local supervision station to undertake the testing.

4) Organizations to undertake the supervision test

Shenzhen Port Tonggu Channel Developing Office appoints Shenzhen Municipal Environmental Supervision Station and Zhuhai Municipal Environmental Supervision Station to under take the testing and analysis within their area. The analysis method of the water sample is according to the relevant National regulations like (Marine Supervision Rules) and (Analysis method of Water and Wasted water).

5) According to the plan and its details of the environment supervision in HK, we will proceed the plan under the request of the related apartment of Hong Kong.

5.5.2 Environment Management Plan

1) The structure of the environment management organization and the relevant policy and mechanism

According to the characteristics of the project, suggested to establish an individual department under Shenzhen Port Tonggu Channel Developing Office. to undertakes the management related to the environmental issues. The head of this department should responsible for environmental protection issues and the implementation of all relative policies, the institution will self testing and monitor the status above the environment and in the meantime with the supervision by the relevant government departments so that if there has any mistake or problem during the supervision process, correction method should take to ensure the smooth construction.

In order to implement all protection policies, enhance the environment management, it should according to the actual status to establish the different

policy for environmental protection like a) the rules and regulation for the environmental works; b) the rules and regulation for the operation, testing, maintenance of the equipment relative to the environment works; c) the reporting system and supervision system; d) rules for technical specification and training

2) Specification of Management Responsibility

Master manager: Be fully responsible for the environment protection work; approve the environment protection measures, performance mechanism and working program; coordinate the relationship of relevant departments and entities; provide sufficient resources to protect the environment;

Environment supervising authority: Familiar with the development options of the project, measures of anti-pollution and composition of the technical staff. Its main responsibilities are: a. Prepare regulations to protect the environment and check its execution; b. Prepare and execute the program to protect the environment; c. organize environmental supervision; d. Work out the management planning and improving measures. In addition to reporting to the chief director of the project, it shall cooperate with relevant department to supervise the environment protection.

Itinerate supervision and check: Stipulate the mechanism of itinerate supervision and checking to regularly check the execution of environment-protective measures, summarize various problems in protecting the environment and work out solutions.

Daily observation of the environment: According to the supervision program, manage daily supervision and report about environment protection.

(3) Supervision and management of environment during the construction period

3) Supervision and management of the environment during the construction period

When appointed to undertake the construction works, the contractor shall also be responsible to control the environment, specify the land site and work out plans to treat waste water and solid wastes and options to ensure the discharge up to the standard. These plans or measures shall be approved before executed.

The local environment administrative authority shall reinforce the supervision of impacts on the environment brought by development of the project and present annual report to the superior concerning the implementation of anti-pollution measures to ensure consecutive execution of the program.

Sea and fishing administrative authorities shall reinforce the supervision of the dumping process and pay close attention to the impacts on the oceanic biology and fishing resources. Any problems found shall be resolved immediately.

4) Measures to deal with emergent cases

Here cases mainly refer to break of the bund or leakage when the dredger moves.

It is suggested that constructors regularly check the bund and safety of the dredgers and the environment protection authority shall check the work of environment protection regularly or irregularly to find out potential danger in time for prompt remedy. In the case of any accident effective measures shall be taken immediately to prevent the polluting impacts from expanding and notify the environment protection authority, which then go to the site in time to find out the cause of the accident, direct to handle the case, require the constructors to take measure to prevent similar accident and claim the administrative, economic and legal responsibilities. In the meantime a report on the accident shall be submitted to the superior.

5.6 The Management in the Future

5.6.1 The Participation of Public

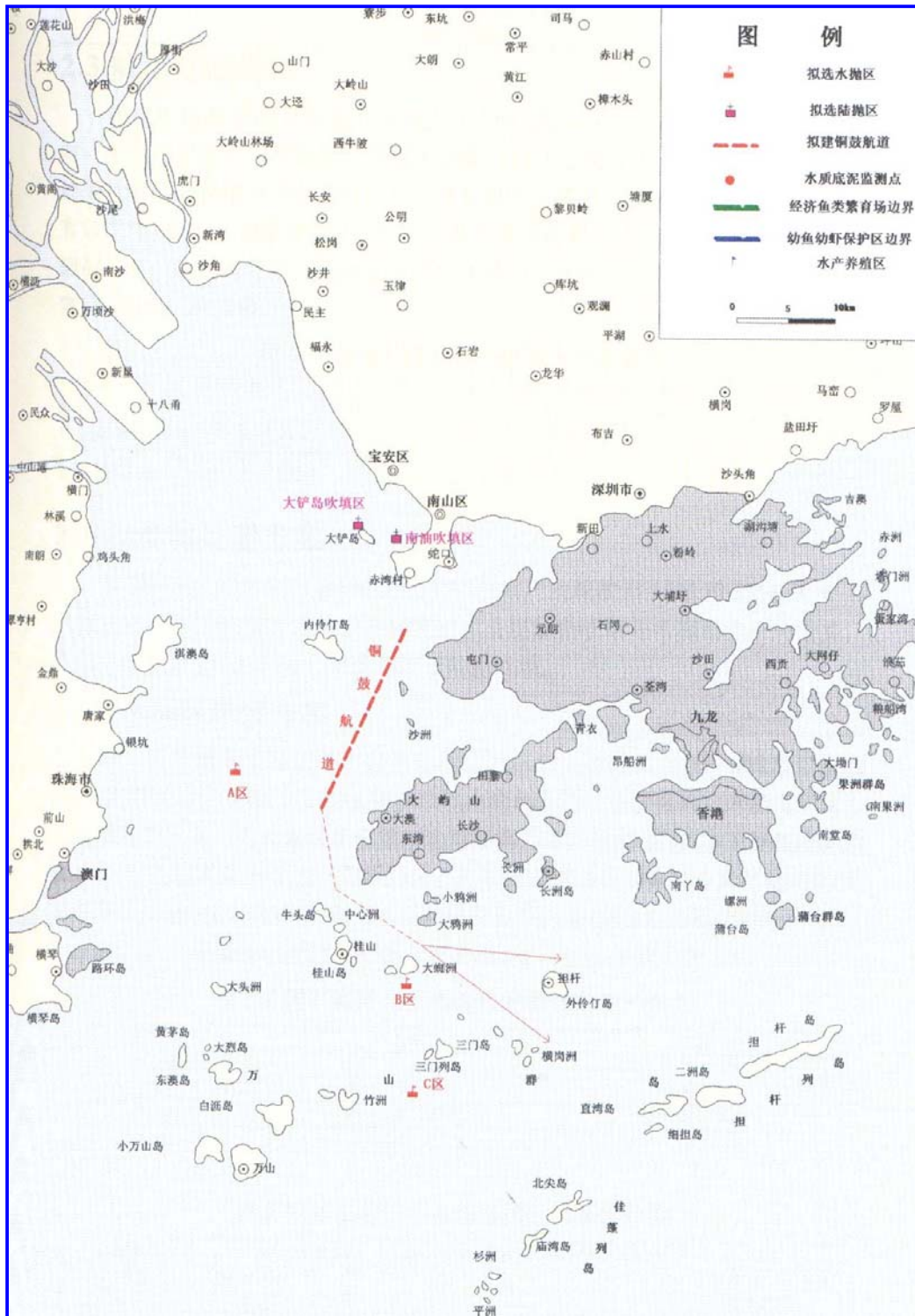
In order to protect the right of public, and fulfill the increasing demand on high environment quality, therefore to generate the comments from the public and make the project is accepted by most of the people. Through this survey, enhance the communication and relationship between the project and the public society. The public consultation will be made obeying the environment impact assessment procedure in HK, including the environment consultation council.

5.6.2 Other Measures

The government in the mainland will keep close relationship with HK special zone government. The essential measures will be used in order to avoid and lessen the effect to the environment in the period of construction and operation.

6 The Related Environment Impact Assessment Reports

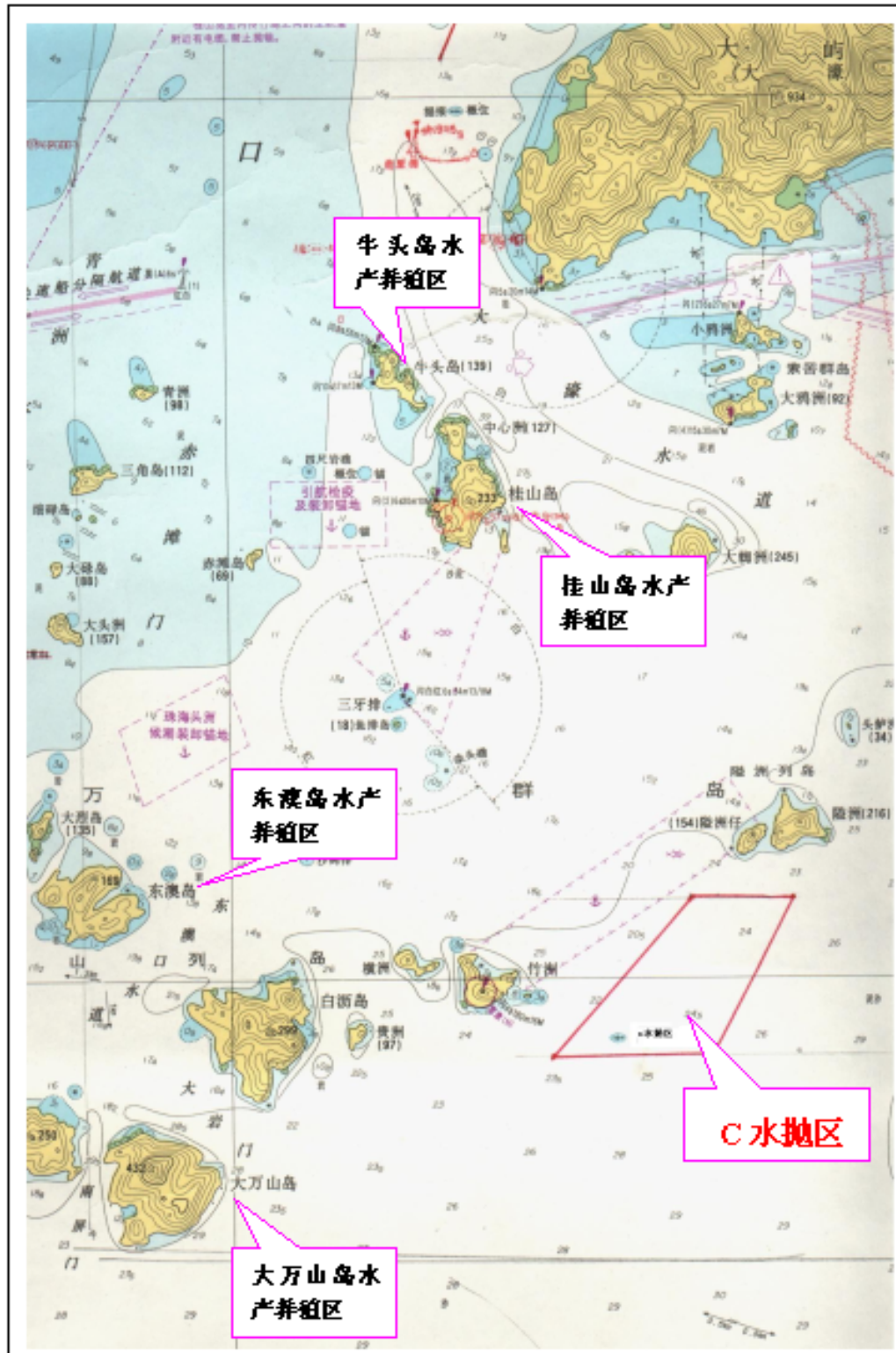
We make this brief to the Tonggu channel engineering on the base of “The Report of the Environment Impact Assessment of the Tonggu Channel” which has been audited by the national environment protection bureau in 2001 and “The Investigation and Confirming Report of the Sea Dumping Area of Dredging Soil of Shenzhen Tonggu Channel” which has been audited by the national sea bureau in 1996.



Graph 1-1 Location of the Project of Tonggu Channel



Graph 4-1 Distribution of major elements near the project site



Graph 1-2 Position of C Dumping Zone and the main environmental elements