10 Impact Assessment of Landscape and Vision

10.1 Introduction

This Chapter is compiled mainly according to Annex 10, *Criteria for Evaluating Landscape and Visual Impacts, and Impact on Sites of Cultural Heritage*, and Annex 18, *Guidelines for Landscape and Visual Impact Assessment, of Technological Memorandum on Environmental Impact Assessment Process* (EIA—TM). It provides the current characteristics of landscape and vision in the Project Areas, assessment of potential impacts of the Project on the landscape and vision, alleviative measures for allsorts of impacts, residual impacts on landscape and vision and their acceptability.

10.2 Scope and Contents of Study

10.2.1 *Study Process*

The landscape and visual impact assessment covers the followings:

(1) Definition of scope and contents of the study;

(2) A baseline study to provide for a comprehensive and accurate description of the baseline landscape and visual character;

(3) A review of the relevant planning and development control framework;

(4) Impact studies to identify the potential landscape and visual impacts and predict their magnitude and potential significance; and

(5) Recommendations on mitigation measures and implementation programme.

10.2.2 *Limits of the Study Area*

The Study Area covers the long and narrow zone from the connection section with Stage I Project downstream of Lo Wu Bridge to downstream of River Ganges along the Shenzhen River. The location is illustrated at Figure 10.1.

The Assessment Area of the physical landscape is determined by the landform on the Hong Kong side. The boundary is the enclosure along the bank on the Shenzhen side. All the potential landscape impacts within the limits of these will be considered.

The Assessment Area of visual impact is limited approximately within Yanhenan road on the Shenzhen side, and it is the same as the Assessment Area of the landscape on the Hong Kong side. The study describes all visually sensitive receivers (VSRs), including residents, pupils, staff and travelers etc..

The Study Area has been divided into five Character Areas:

- Lo Wu
- Yuan Ling Tsai
- Nam Hang
- Man Kam To
- Muk Wu

Figure 10.2 illustrates the locations and extents of the Character Areas.

10.2.3 *Description of the Proposed Works*

A description about the project design, layout and construction has been given in Chapter 2 of this report.

Elements of the proposed Works that would have landscape and visual impacts comprise the new river course, embankments, the border fence, the border roads, spoil disposal sites, works area etc..

Landscape impacts will be primarily caused by reduction of fishponds, marshes, woodlands, low-lying grasslands/fallow fields and arable lands, embankment, the change of the river course and bank slope (river lining), the change of the spoil disposal site elevation and the bare area led by construction.

Visual impacts will be primarily caused by dredging, widening, straightening, dyke construction, spoil disposal and bridge reconstruction.

10.2.4 *Key Issues to be Addressed*

The landscape and visual impact assessment identifies the impacts on the resources that make up the landscape, on the character of that landscape and on the visual

amenity of that area. A clear distinction is drawn between the landscape impact and the visual impact.

Key issues relating to the landscape impact of the scheme will include:

- Loss of fishponds and marshes;
- Loss of low-lying grasslands/fallow fields;
- Loss of woodlands;
- Loss of arable lands;
- Change in the river course;
- The natural river course will be replaced by a new one that is lined with concrete or rock blocks after construction;
- The valley and low-lying ground near Nam Hang will be filled and leveled up with the spoil from the Project, the elevation of the area will increase;
- Reconstructing Lo Wu Railway Bridge;
- Strengthening the Lo Wu New Footbridge;
- Rebuilding the Lo Wu Old Footbridge;
- Demolishing two existing Man Kam To Vehicular Bridge;
- Building Man Kam To Two-way Vehicular Bridge.

Key visual issues to be addressed will include impacts on:

On the Hong Kong side:

- Some residents of Lo Wu Tsuen;
- Staff of Lo Wu Station;
- Pupils and staff of Lo Wu Public School;
- Staff of Man Kam To Border Crossing ;
- Residents of Muk Wu Tsuen;

- Residents of Nga Yiu Tsuen; and
- Staff of Muk Wu Pumping Station.

On the Shenzhen side:

- Staff of Lo Wu Station Terminal Building;
- Staff of Man Kam To Border Crossing;
- Residents living in the dormitory of Man Kam To Station;
- Residents of Lo Wu Fourth Tsuen;
- Residents of Huaqiao New Village; and
- Residents of Xinxiu New Village.

10.2.5 *Principal View Corridors*

Principal view corridors have been identified as follows:

- Views east from the existing Lo Wu New Footbridge;
- Views west from the existing Lo Wu New Footbridge;
- Views Hong Kong side from Shenzhen side along Shenzhen River from the downstream of Lo Wu Bridge to River Ganges;
- Views Shenzhen side from Hong Kong side along Shenzhen River from the downstream of Lo Wu Bridge to River Ganges.

10.2.6 *Methodology for Assessment of Landscape and Visual Impacts*

Landscape impacts are assessed on the following two aspects:

- Impacts on landscape resources;
- Impacts on landscape character.

Landscape impacts are assessed as a function of the magnitude of an impact and the sensitivities of the landscape resources and the landscape character.

Landscape sensitivity is the ability of the landscape or character to accommodate

change without prejudice to the quality of that resource. For example, delicate plant ecosystems will be sensitive to changes in landscape resources whilst landscape with a diversity of elements will tend to be less sensitive to changes in landscape character.

Impacts are assessed as high, moderate or low. Insubstantial impacts are termed negligible. A matrix is used to assess landscape impacts and is shown in Table10. 1.

Table 10. 1 Assessment Matrix of Landscape Impacts

Magnitude of Change	Sensitivity of Landscape Resources/Character		
	High	Mid	Low
High	High	High to Mid	Mid to Low
Mid	High to Mid	Mid to Low	Low to Negligible
Low	Mid to Low	Low to Negligible	Low to Negligible

The assessment of visual impacts is structured by receiver's sensitivity. Visually Sensitive Receivers (VSRs) are identified through the definition of the project's "zone of visual influence". Receivers have been grouped into the following categories:

- Residential: Those people who would view the project from their homes;
- Occupational: Those people who would view the project from their workplaces;
- Pupils: Those people who would view the project from their schools;
- Travelers: Those people who would view the scheme from their vehicles or on foot

Sensitivity of visual impact receivers depends on the angle, activity and the number of people. Receivers are categorized as being of high, medium, or low sensitivity to visual impacts.

Those who view the scheme from their homes are classified as a high sensitivity group. This is because the attractiveness, or otherwise, of the view would have a notable effect on a resident's general quality of life and acceptability of their home environment.

Those who view the scheme from their workplace are classified as a low sensitivity group. This is because they are employed in activities where visual outlook plays a less important role in the perception of the quality of the working environment.

For those people who view the scheme from public thoroughfares, the degree of visual intrusion experienced depends on the speed of travel and whether views are continuous or only occasional. Generally, the slower the speed of travel and the more continuous the viewing experience, then the greater the degree of sensitivity.

The pupils are classified as a medium sensitivity group.

The criteria used to determine the magnitude of change to a view are given below:

- Value of existing views
- Degree of change of views
- Proximity of receivers
- Availability and amenity of alternative views

Impacts are assessed as high, moderate or low. Insubstantial impacts are termed negligible. A matrix is used to assess visual impacts and it is shown in Table 10. 2 below.

Table 10. 2 Assessment Matrix of Visual Impacts

Magnitude of Change	Sensitivity of Receiver Group		
	High	Mid	Low
High	High	High to Mid	Mid to Low
Mid	High to Mid	Mid to Low	Low to Negligible
Low	Mid to Low	Low to Negligible	Low to Negligible

10. 3 Baseline Study

10. 3. 1 *Introduction*

Stage Ⅲ Project covers the section from River Ganges to downstream of Lo Wu Bridge. The Study Area of landscape and visual impact comprises the two sides of the Shenzhen River reach involved in Stage Ⅲ Project. The south side includes Lo Wu, Yuan Ling Tsai, Man Kam To and Muk Wu of Hong Kong and the north side include Lo Wu District of Shenzhen City. Besides, the five border crossing bridges are also included in the Study Area.

The baseline study on landscape and vision covers field survey, photographing, and aerial photographs. Meanwhile, a visit to the local residents is also made to understand the visual impression and psychological feelings of the local residents on landscapes.

Constraints to baseline study:

Because the Study Area is located on the border area between Shenzhen and Hong Kong, the field survey, photographing and plotting are strictly restricted, and entering the Study Area must be authorized by polices. In the border area, field survey has to be appointed by polices. Photographing has also had to be permitted by polices on what landscape, and from where and what angle, to be photographed. Plotting is prohibited. Moreover, Chinese researcher can not get across the border to the Hong Kong side to do any research.

Because of the above-mentioned constraints, no continuous landscape view of both the Shenzhen River sides can be photographed or delineated, and therefore, only local views can be photographed in the baseline study of landscape and vision. Moreover, the photos can not be taken from ideal site and ideal angle, especially from higher places for larger scope visions. Polices and defense army prohibit researchers to take any picture and to do any plotting on Lo Wu Footbridge (including both the new and the old ones), Lo Wu Railway Bridge, and Man Kam To Old/New Bridges. Therefore, photographs of the major visions can not be completely provided in this study.

Baseline study brief

Result of fields survey shows: The right side involved in Stage III Project is located in Lo Wu District of Shenzhen City. The areas nearby the bank have been developed already with buildings and enclosure along the bank, The major scenic spots are Man Kam To Border Crossing, Lo Wu Border Crossing, Shenzhen Railway Station, Border Patrol Road, warehouse, and a few residential buildings.

On the Hong Kong side, the land is basically kept under natural condition. Near the bank is low-lying wetland, most of which is waste grassland grown with some shrubs. There are a few ponds near Lo Wu Border Crossing and Yuan Ling Tsai, and some farmland around Man Kam To and Muk Wu. 300—500 m beyond the bank is hill place with luxuriant vegetation. Near the bank the major buildings are border fa-

cilities such as control port buildings and watching towers, and Muk Wu Pumping Station. Far away from the riverside are Lo Wu Tsuen and Muk Wu Tsuen located in dense woods.

Topography and vegetation conditions of the Study Area are shown in Figure 10. 3.

The residents living along the section involved in Stage III Project reflect that the river has long not been maintained, thus flood flow is usually retarded, channel is silted, and flooding often occur on both sides during rainy season. After the flood and tidal recessions, both sides are exposed with mud and garbage. In recent years, the river water is severely polluted because of the huge volume of effluents in association with the rapid economic development. The water body becomes black and gives off bad smell. Due to dump of garbage and spoil, the water surface is full of all-sorts of drifts, which not only pollutes the water body, but also ruins the vision. Residents nearby suffer a lot from it and complain strongly.

There are five crossing border bridges within the Study Area. They are Lo Wu New Footbridge, Lo Wu Old Footbridge, Lo Wu Railway Bridge, Man Kam To New Bridge and Man Kam To Old Bridge. The Lo Wu New Footbridge is used by a lot of travelers everyday, while the Lo Wu Old Footbridge is used only by staffs of both sides' control ports and farmers, totaling about 20 — 30 people. The Man Kam To New Bridge and the Man Kam To Old Bridge are used by Vehicles, on which the main traffic is container cars besides a few private cars.

The five Character Areas that relate to the landscape and visual impact assessment are shown in Figure 10. 2.

- Lo Wu
- Yuan Ling Tsai
- Nam Hang
- Man Kam To
- Muk Wu

10. 3. 2 *Character Area No. 1-Lo Wu*

On the Shenzhen side, the area mainly included Lo Wu Station Terminal Building,

Custom Building, Border Inspection Practice Base, Shenzhen Railway Station and Lo Wu Commercial Building, besides the river course and the Border Patrol Road. The enclosure was built along the riverbank. There are sparsely distributed plots of vegetable field (belonging to border guards) besides the weed growing in the river course, but there is no natural vegetation.

On the Hong Kong side, Lo Wu Station Terminal Building is located in the western part and Lo Wu Public School and Lo Wu Tsuen are in the middle. Most of Lo Wu Tsuen is sheltered by Border Crossing building and Lo Wu Railway Station, with just a few houses in the eastern part can be viewed. The eastern part is hills with good vegetation.

There are three cross border bridges in this area, i.e., Lo Wu New Footbridge, Lo Wu Old Footbridge and Lo Wu Railway Bridge.

Landscape of this area is characterized by urban character, with many man-made buildings such as railway station, custom, schools, residential building, and bridges. Besides the little weeds on the riverside, there is little vegetation in the area of construction. There are no trees, fishponds or any other objects that have landscape value. There are some plots of woodland in the eastern part of Lo Wu Tsuen outside the construction site on the Hong Kong side.

The main constructions of the project in this area include dredging, widening, deepening the river course, building the Border Patrol Roads and reconstructing the three crossing border bridges.

Character Area No. 1 is illustrated in Figure 10.4. The distribution of existing landscape resources see also Figure 10.3, the Lo Wu New Footbridge is illustrated in Figure 10.5, the Lo Wu Old Footbridge is illustrated in Figure 10.6, the Lo Wu Railway Bridge is illustrated in Figure 10.7.

10.3.3 *Character Area No. 2-Yuan Ling Tsai*

The existing river course take the shape of an elongated 'n'. On the Shenzhen side, the Border Patrol Road is near the river channel. The bounding wall is on the north of the Patrol Road. Outside the wall is Yanhenan road. There is an office on the south of the road and the dorm buildings of the Border Check Terminal on the east.

On the Hong Kong side, fishponds take the most part, but in the eastern part there are some hills with trees; the rest are flat fallow fields with a few trees. There is no resident nor any building.

Landscape in this area is mainly urban landscape on the Shenzhen side, and there is no natural landscape resource. But it shows typical natural landscape character on the Hong Kong side, with a luxuriant cover of vegetation, and the fishponds, especially those with larger area, have a higher landscape value.

The main constructions of the project in this area include dredging, widening, deepening, straightening the river course and building the Border Patrol Roads.

Character Area No. 2 is illustrated in Figure 10. 8, and the distribution of existing landscape resources see also Figure 10. 3.

10. 3. 4 *Character Area No. 3-Nam Hang*

The river course is mainly meanders taking the shape of an impleted 'm'. On the Shenzhen side, the Border Patrol Road is near the river channel. The bounding wall is by the side of the Border Patrol Road. Outside the bounding wall are warehouses and parks.

On the Hong Kong side, there are hills, depressions among hills, marshes, bloodworm ponds and flat fallow fields. Vegetation of this area is good, with most being grassland and a few trees. There is no resident nor any building.

It is mainly urban landscape in this area on the Shenzhen side, and there is no natural landscape resource. It shows natural landscape character on the Hong Kong side, covered with luxuriant vegetation. The landscape is mainly characterized by meandering river course, abandoned fishponds, marshes, hills and low-lying land.

The main constructions of the project in this area include dredging, widening, deepening, straightening the river course and building the Border Patrol Roads.

Character Area No. 3 is illustrated in Figure 10. 9, current status of Nam Hang spoil disposal ground is illustrated in Figure 10. 9a, distribution of existing landscape resources sees also Figure 10. 3.

10.3.5 *Character Area No. 4-Man Kam To*

The existing river take the "Ω" shape meandered river channel. On the Shenzhen side, the Border Patrol Road is near the river course. Outside the Border Patrol Road is boundary wall. The main buildings outside the boundary wall are Man Kam To Border Crossing buildings.

On the Hong Kong side, the meander of the river is low-lying lands, marshes, with weed growing on. Vegetation of this area is quite good. Some hills with exuberant trees are located on the south of the meander. There are no other buildings except for the Border Crossing Buildings and the watch towers. No one resides in it.

There are two border crossing vehicular bridges in this area, i.e., the Man Kam To New Bridge and the Man Kam To Old Bridge. They will be demolished, and a new Two-way vehicular bridge will be built to replace them.

This area is small and is mainly characterized by urban landscape on the Shenzhen side. Border crossing building is the main vision, and there is no natural landscape resource. But it is natural landscape on the Hong Kong side, vegetation is good, and the main landscape characters are the meandering river course and the low-lying grassland within the meander of the river.

The main constructions of the project in this area include straightening the river course, rebuilding Man Kam To Two-way vehicular Border Crossing Bridge and building the Border Patrol Roads.

Character Area No. 4 is illustrated in Figure 10.10. Distribution of existing landscape resources sees also Figure 10.3. The Man Kam To Old Bridge is illustrated in Figure 10.11, the current status of the Man Kam To Old Bridge section is illustrated in Figure 10.11a (upstream) and Figure 10.11b (downstream) and the Man Kam To New Bridge is illustrated in Figure 10.12.

10.3.6 *Character Area No. 5-Muk Wu*

The river course of this area is relatively straight. On the Shenzhen side, the Border Patrol Road is near the river course, outside of the Road is boundary wall, and further outside boundary wall the are offices, warehouse, garage, park, Huaqiao new

Village and Xinxiu Village.

There are Muk Wu Pumping Station, Muk Wu Tsuen and Nga Yiu Tsuen on the Hong Kong side, Muk Wu Tsuen is located on the west side of a hill, on the east side are trees. The land nearby the bank is flat with good greensward.

It is urban landscape in this area on the Shenzhen side, being mainly residential areas, and there is no natural landscape resource. On the Hong Kong side, the west part also takes a vision of urban landscape, with Muk Wu Pumping Station located in, while the east part takes a vision of natural landscape, including hills, mountain forest, low-lying grasslands and agricultural lands.

The main constructions of the project in this area include dredging, widening, deepening, straightening the river course and building the Border Patrol Roads.

Character Area No. 5 is illustrated in Figure 10. 13. Distribution of existing landscape resources sees also Figure 10. 3.

10. 4 Planning and Development Control Framework

On the Shenzhen side, the land along Stage III of the Shenzhen River Regulation Project has already been developed, therefore, the project has no effect on land use plan of Shenzhen side. On the Hong Kong side, in the light of the *North District Development Program* issued by Hong Kong Territory Development Department, it is known that there is no development program in the scope of the Study Area. The Project Area of Fanling, Sheung Shui Development Program is the nearest one to the construction site of the Stage III of the Project, but it is outside the area of the project. thus, the project has no effect on land use plan of Hong Kong side. According to the *Fu Tei Au and Sha Ling Zoning Plan* drawn up by Hong Kong Town Planning Board following the Town Planning Ordinance, the Study Area is also outside the range of the plan. The north boundary of Fu Tei Au and Sha Ling Zoning Plan is indicated in Figure 10. 1; the Study Area lies to further north of the north boundary.

There are no statutory and non-statutory landscapes and scenic spots.

10.5 Landscape Impact Assessment

10.5.1 *Introduction*

The study seeks to address potential landscape impacts which may be caused by Stage III of the Shenzhen River Regulation Project. Sources of impact are dredging and the construction of embankment, besides, long term impacts will result from permanent changes in the landscape characteristics of the Study Area. Landscape impacts are indicated in Table 10.3, and Figure 10.14 to Figure 10.18.

10.5.2 *Sources of Landscape Impacts*

Construction Stage

The sources of construction stage landscape impacts include:

- Building the Border Patrol Roads and the border fence;
- Site clearing;
- Construction site;
- Excavating river course;
- Embankment;
- Site fence;
- Lining river course;
- Spoil disposal;
- Construction used land;
- Loss of fishponds;
- Loss of marshes;
- Loss of vegetation.

Operation Stage

The sources of operation stage landscape impacts include:

Table 10.3 Landscape Impact (Refer From Figure 10.14 To Figure 10.38)

Landscape Resources	Sources of Impact	Type of Impact	Size of Impact			Land-scape Sensiti-vity	Residual Impact Characteristic		
			Cons-truction Stage	Operation Stage			Cons-truction Stage	Operation Stage	
				First Day	Tenth Year			First Day	Tenth Year
Lo Wu: • Existent natural channel • Grassland along riverside • Bridges	• Newly-built Border Net and Patrol Road • Construction Site • Excavation of channel • Embankment • Construction net • Lined channel • Construction used land • Course of channel • Loss of vegetation • Rebuilding of bridges	Landscape character, Landscape resources	Moderate negative impact	Low negative impact, moderate positive impact	Low negative impact, moderate positive impact	Mid	Low-negligible negative impact	Low-negligible negative impact, moderate-low positive impact	Low-negligible negative impact, moderate-low positive impact
Yuan Ling Tsai: • Existent natural channel • Fishponds • Marsh • Farmland • Low-lying grassland • Woodland	• Newly-built Border Net and Patrol Road • Construction Site • Excavation of channel • Embankment • Construction net • Lined channel • Construction used land • Course of channel • Loss of fishponds • Loss of marsh • Loss of farmland • Loss of low-lying grassland • Loss of woodland	Landscape character, Landscape resources	High negative impact	Moderate negative impact, high-moderate positive impact	Low negative impact, moderate positive impact	Mid	Moderate-low negative impact, moderate-low positive impact	Moderate-low negative impact, moderate-low positive impact	Low-negligible negative impact, moderate-low positive impact

Landscape Resources	Sources of Impact	Type of Impact	Size of Impact			Landscape Sensitivity	Residual Impact Characteristic		
			Construction Stage	Operation Stage			Construction stage	Operation Stage	
				First Day	Tenth Year			First Day	Tenth Year
Nam Hang: • Existent natural channel • Marsh • Low-lying grassland	• Newly-built Border Net and Patrol Road • Construction Site • Excavation of channel • Embankment • Construction net • Lined channel • Construction used land • Course of channel • Loss of marsh • Loss of low-lying grassland	Landscape character Landscape resources	High negative impact	Moderate negative impact, high-moderate positive impact	Low negative impact, moderate positive impact	Mid	Moderate-low negative impact	Moderate-low negative impact, moderate-low positive impact	Low-negligible negative impact, moderate-low positive impact
Man Kam To: • Existent natural channel • Marsh • Low-lying grassland • bridges	• Newly-built Border Net and Patrol Road • Construction Site • Excavation of channel • Embankment • Construction net • Lined channel • Construction used land • Loss of marsh • Loss of low-lying grassland • Backout of old bridge • Newly-built bridge	Landscape character Landscape resources	Moderate negative impact	Moderate negative impact, high-moderate positive impact	Low negative impact, moderate positive impact	Mid	Low-negligible negative impact	Moderate-low negative impact, moderate-low positive impact	Low-negligible negative impact, moderate-low positive impact

Landscape Resources	Sources of Impact	Type of Impact	Size of Impact			Landscape Sensitivity	Residual Impact Characteristic		
			Construction Stage	Operation Stage			Construction stage	Operation Stage	
				First Day	Tenth Year			First Day	Tenth Year
Muk Wu: • Existent natural channel • Low-lying grassland • Farmland • Massif • Woodland	• Newly-built Border Net and Patrol Road • Construction Site • Excavation of channel • Embankment • Construction net • Lined channel • Construction used land • Course of channel • Loss of low-lying grassland • Loss of farmland • Loss of woodland	Landscape character Landscape resources	High negative impact	Moderate negative impact, high-moderate positive impact	Low negative impact, moderate positive impact	Mid	Moderate -low negative impact	Low-negligible negative impact, moderate-low positive impact	Low-negligible negative impact, moderate-low positive impact

- The newly-built Border Patrol Roads and the border fence;
- Change in river course (straightening);
- The artificially lined river course;
- The new embankment;
- The newly-built bridge.

10.5.3 *Prediction and Evaluation of Landscape Impacts*

Construction Stage

The landscape impacts in the construction Stage will include impacts on landscape resources and landscape character. The impacts are described as below for each Character Area.

Character Area No. 1

Landscape impact in Character Area No. 1 is illustrated at Figure 10.14, which includes:

Construction activities such as widening river channel, filling up banks, rebuilding border fence and roads will lead to loss of grassland near the river, but the lost area is small, about 2500 m^2 of grassland and 100 m^2 of woodland, thus negative impact of the loss is low to landscape resources;

To widen river channel and rebuild riverbank will changes the natural condition of the river, negative impact of the change is medium to landscape character;

Negative impact of the embankment is medium to landscape character;

Negative impact of rebuilding bridge is medium to landscape character;

Negative impacts of rebuilding border fence and roads are low to landscape character;

After the Project is finished, some construction occupied land will remain bared, but the area is small, and the negative impacts are low to landscape character.

Character Area No. 2

Landscape impacts on Character Area No. 2 are illustrated at Figure 10. 15, which includes:

Construction activities such as widening river channel, filling up banks, rebuilding defense nets and roads, occupying land temporarily will lead to losses of fishponds, marshes, farmland, woodlands and low grasslands, negative impacts of the losses are high to landscape resources. Lost area is as follows:

Fishponds: 54,400 m^2; Marshes: 2,800 m^2; Farmland lands: 16,000 m^2; Woodlands: 12,000 m^2; Low-lying grasslands: 36,000 m^2.

Negative impacts resulted from widening river channel, lining channel and filling up banks are moderate to landscape character;

After the Project is finished, some construction occupied land will remain bared. The negative impacts are moderate to landscape character.

Character Area No. 3

Landscape impacts on Character Area No. 3 is illustrated at Figure 10. 16 which includes:

Construction activities such as widening river channel, filling up banks, rebuilding border fence and roads, temporarily occupying land and spoil disposal that lead to losses of ponds, marshes, woodlands, shrub lands, hillside and low grasslands. The negative impacts of the losses are high to landscape resources, and lost area is as follows:

Fishponds: 15,600 m^2; Marshes: 59,700 m^2; Woodlands: 9,000 m^2; Low-lying grasslands: 71,000 m^2; Hillside grasslands: 58,500 m^2; Shrub land: 4,000 m^2;

Negative impacts resulted from widening river channel, lining the channel and filling up banks are moderate to landscape character;

Negative impacts of the bared ground caused by discarding soil in disposal site are moderate to landscape character;

After the Project is finished, some construction occupied land will remain bared, but the negative impact is low to landscape character.

Character Area No. 4

Landscape impacts on Character Area No. 4 is illustrated at Figure 10.17, which includes:

Construction activities such as widening river channel, filling up banks, rebuilding defense nets and roads, temporarily occupying land will lead to losses of marshes and low-lying grasslands. The negative impacts of the losses are high to landscape resources, and lost area is as follows:

Marshes: 2,400 m^2; Low-lying grasslands: 33,000 m^2; Hillside grasslands: 1,720 m^2; Farmlands: 15,000 m^2;

Negative impacts resulted from widening river channel, lining the channel and filling up banks are moderate to landscape character;

Negative impacts of removing the Man Kam To New/Old Bridges and newly building the Two Vehicular Man Kam To Two-way Bridge are moderate to landscape character;

After the Project is finished, some construction occupied land will remain bared, but the negative impacts are low to landscape character.

Character Area No. 5

Landscape impacts on Character Area No. 5 is illustrated at Figure 10.18, which includes:

Construction activities such as widening river channel, filling up banks, rebuilding border fence and roads, temporarily occupying land will lead to losses of marshes, woodlands, farmlands and low-lying grasslands. The negative impacts are high to landscape resources, and lost area is as follows:

Marshes: 8,400 m^2; Woodlands: 4,000 m^2; Low-lying grasslands: 74,000 m^2; Farmlands: 26,000 m^2;

Negative impacts resulted from widening river channel, lining the channel and filling up banks are moderate to landscape character;

After the Project is finished, some construction occupied land will remain bared, but

the negative impacts are low to landscape character.

The statistical results of the lost area of the landscape resources by the project are indicated in Table 10—3a.

Table 10—3a Statistics of the Lost or Destroyed Landscape Resources Unit: hm^2

Character Area	Fishponds	Marshes	Framlands	Woodland	Low-lying grasslands	Hillside grasslands	Shrub lands
1				0.01	0.25		
2	5.44	0.28	1.6	1.2	3.6		
3	1.56	5.97		0.9	7.1	5.85	0.4
4		0.24	1.5		3.3	0.172	
5		0.84	2.6	0.4	7.4		
Total	7.00	7.33	5.7	2.51	21.65	6.022	0.4

Operation Stage

Landscape impacts in the operation stage will include the impact on landscape resources and landscape character, they are illustrated from Figure 10.19 to Figure 10.27, which includes:

After the river channel is widened, area of water surface will increases, which can compensate for the loss of landscape resources caused by new river course.

The loss of landscape resources caused by embankment can be compensated by means of greensward used to protect bank slope. The loss of landscape resources caused by temporarily land occupation can be compensated by restoration of former usage or vegetation after construction is finished. But in the initial period of the operation stage, the restored landscape resources quality can not reach existing level. Therefore, the project still has a low negative impact on landscape resources. However, it is expected that the restored landscape resources quality compensated can completely reach the existing level in ten years, and by that time, the project will has no negative impact on landscape resources.

It will be a positive impact that sediment in the river channel is dredged (the river channel landscapes before and after the project are illustrated at Figure 10.23).

After the river channel is lined, the natural slope of the former river bed will be modified, and it will cause a low negative impact on landscape character.

Newly built river banks will changes landscape character, but it will be a low negative impact on landscape character.

After the project is finished, the new river course will be straighter than the old one, it has low negative impact on landscape character.

Because its appearance and structure are not changed after the Lo Wu New Footbridge is strengthened, there will be no negative impact of reconstruction on landscape character. The same is Lo Wu Railway Bridge reconstruction. As the reconstructed Lo Wu old Footbridge is more beautiful than the existing one, rebuilding will have a positive impact on landscape character. The Lo Wu New Footbridge is illustrated at Figure 10. 20, and the rebuilt Lo Wu Railway Bridge is illustrated at Figure 10. 21.

As the river reach involved in Stage III joins the section involved in Stage I in an easy manner at downstream of Lo Wu Bridge (there is a branch, named Ng Tung River, on the south bank), a discontinuity of river channel landscape will not be caused between the upper and the lower sections of Lo Wu bridge.

After the existing new/old Man Kam To Bridges are removed, a new Man Kam To Two-way vehicular Bridge will be built. As the latter is only 1. 5 m away from the existing new Man Kam To Bridge, moreover, the new Two-way Bridge will be more beautiful than the to-be-removed ones, reconstruction will have no negative impact on landscape character. The Man Kam To New Two-way Bridge is illustrated at Figure 10. 26. The landscape of the new Two-way vehicular Bridge section at the first day in construction is illustrated in Figure 10. 26a (upstream) and Figure 10. 26b (downstream), and at the tenth year, it's illustrated in Figure 10. 26c (upstream) and Figure 10. 26d (downstream).

Elevation of the spoil disposal sites will be increased with a maximum value of 6 m after construction spoil disposal, thus causing a modification to landscape character. However, this modification can not be judged as a negative impact. The landscape of the Nan Hang spoil disposal ground at the first day in construction is illustrated in Figure 10. 30a, and at the tenth year, is illustrated in Figure 10. 30b.

10. 5. 4 *Mitigation Measures*

Landscape impact mitigation measures on landscape are illustrated from Figure 10. 28 to Figure 10. 33.

The proposed mitigation measures are to seek for reducing the project's potential negative impacts to the lowest level. These measures cover: to reduce loss of landscape

resources to as low a level as possible; to recover lost ponds, marshes, and vegetation; to compensate for the project's negative impacts by means of improving the landscape.

The proposed mitigation measures are all implemented in the construction site.

Construction Stage:

- Conduct the project design precisely and the construction operation carefully to reduce losses of woodland, grassland, pond and marsh to a level as low as possible;
- Replant the trees which are influenced by construction to other suitable sites such as the cut-off river meander area;
- After construction is finished, timely remove all temporary construction facilities in each construction area, and recover the original land use patterns. For land that can not be recovered, trees and greensward must be planted so that the loss of landscape can be compensated and local landscape character can be improved;
- Vegetation recovery must be done on spoil sites according to suggestions put forward in Chapter 8 after spoil treatment is finished;
- According to suggestions put forward in Chapter 8, reform the cut-off old river meander area into ponds and marshes and plant native riparian trees there to compensate for environment losses;
- To plant grasscrete on the berm of the new river channel;
- To plant greensward on newly-built banks.

(1) Character Area No. 1

- Restore construction sites to original land use patterns or to vegetation after construction is finished: on the Shenzhen side, original uses of the construction sites must be completely restored after all bridge constructions are finished; on the Hong Kong side, The Ng Tung River channel occupied by construction of bridge and foundation must be restored to original status, while the other parts of the construction sites, about 1,600 m^2 in area, must be planted with greensward. Grass species must be selected following suggestions specified in Chapter 8.

Mitigation measures for Character Area No. 1 are illustrated at Figure 10.28.

(2) Character Area No. 2

- After construction is finished, immediately remove the temporary construction facilities;

- Plant grasses and trees in the construction used land: plant 15,800 m^2 grasses, 450 trees and 3,950 shrubs (reformation of the old meander is not included). Trees and shrubs are arranged in the style of 2 shrubs between every 2 trees, the distance between every two individuals, no matter what tree or shrub, is 2 m;

- Restore fishponds according to suggestions specified in Chapter 8, as is illustrated at Figure 8.32. The restored area is 3.6 hm^2;

- According to suggestions put forward in Chapter 8, reform the cut-off old river meander area into ponds and marshes and plant native riparian trees there to compensate for environment losses. The reformed area is about 1.64 hm^2;

Mitigation measures for Character Area No. 2 are illustrated at Figure 10.29.

(3) Character Area No. 3

- Plant grasses and trees on the construction used land along the north bank of the new river channel, totaling 29,500 m^2 grasses, 820 trees and 7,380 shrubs (reformation of the old meander is not included). The planting method is the same as that specified for Character Area No. 2;

- Vegetation restoration must be done for the spoil disposal site after the disposal is finished. Under the 18 m elevation, i.e., below the top platform, greensward must be planted, totaling an area of 6,500 m^2, while above that elevation, both greensward and trees must be planted, totaling 5 hm^2 grasses, 1,400 trees and about 12,500 shrubs.

Mitigation measures for Character Area No. 3 are illustrated at Figure 10.30.

(4) Character Area No. 4

- According to suggestions put forward in Chapter 8, reform the cut—off old river meander area into ponds and marshes and plant native riparian trees there to compensate for environment losses. The reformed area is about 1.11 hm^2;

Mitigation measures for Character Area No. 4 are illustrated at Figure 10.31.

(5) Character Area No. 5

- According to suggestions put forward in Chapter 8, reform the cut-off old river

meander area into ponds and marshes and plant native riparian trees there to compensate for environment losses. The reformed area is about 2,140 m^2;

- Plant grasses and trees on the construction used land along the north bank of the new river channel, totaling 1.07 hm^2 grasses, 300 trees and 2,670 shrubs (reformation of the old meander is not included). The planting method is the same as that specified for Character Area No. 2.

Mitigation measures for Character Area No. 5 are illustrated at Figure 10.32 and 10.33.

Operation Stage:

As mentioned above, the sources of operation stage landscape impacts include:

(1) The newly-built Border Patrol Roads and the border fence;

(2) Change in river course direction (straightening);

(3) The artificially lined river course;

(4) The new embankment;

(5) The newly-built bridge.

According to the characteristics of the project, except for Item 3, all impacts caused by all other items are unavoidable and no measure can be taken for them.

For the landscape impact caused by artificially lined river course, a measure has been planned, i.e., planting grasscrete on the berm of the new river course in construction stage, to mitigate the impact.

To sum up, it is concluded that no special measure is necessary for mitigating landscape impacts in the operation stage.

When construction starts in each construction area of the project, corresponding mitigation measures to landscape impacts, such as planting trees along the border of construction area to form visual barrier, must be taken at the same time. Besides, mitigation measures, such as planting grasses and trees, establishing grass bank protection, reforming the old meander area, must also be finished simultaneously with project construction.

Contractors of the project are responsible for implementation of all the landscape mitigation measures, and all the cost must be included into project expenditure. The

planted trees, greensward, and restored ponds and marshes for mitigating landscape impacts are to be managed by Agriculture, Fishenies and Conservation Department on the Hong Kong side, and by related governmental department on the Shenzhen side.

Except the above landscape mitigation measures, for mitigate the ecological impact and prevent the soil and water loss, the grasscrete planted on the berm of the river course and the crest of the embankment, the greensward planted on the riverside slope of the riverbank, the area of the water surface increased with the widening of the river course can all compensate the landscape sources objectively.

The statistics of the compensated landscape sources is shown in table 10. 3b.

Table 10. 3b Statistics of the Compensated Landscape Sources **Unit: hm²**

Character Area	Restore Fishponds	Reform Marshes (hm²)	Plant Grasses (hm²)	Plant Trees	Area of the Water Surface Increased with Widening the River Course (hm²)	Grasscrete on top of the Embankment (hm²)	Grasscrete on the Flat — roofs of the River Course (hm²)	Greensward on the Riverside Slope of the Riverbank (hm²)
1			0. 16					
2	3. 6	1. 64	1. 58	4400				
3			8. 60	8200				
4		1. 11						
5		0. 214	1. 07	2970				
Total	3. 6	2. 964	11. 41	15570	20. 0	4. 0	4. 0	6. 0

10. 5. 5 *Residual Landscape Impact*

A residual landscape impact is defined as a negative impact that cannot be mitigated after all practical methods of mitigation have been implemented.

Residual landscape impacts are list in Table 10. 3.

After construction used lands are restored to their original uses or vegetation, the loss of landscape resources will be offset. After the cut-off old meander area is reformed into ponds or marshes and trees are planted there, the loss of landscape resources caused by land occupation of new river course will also be offset. The negative impacts of the project on landscape resources are relatively low, and it will be negligible after the project operates for ten years later.

After the project is finished, the course of the river channel will be modified. As the

new river course is only a little straighter than the old one, the negative impact on landscape character is insignificant.

Newly-built border fence, Border Patrol Roads and dikes have a low negative impact on landscape character.

Residual landscape impacts are illustrated from Figure 10. 34 to Figure 10. 38.

10. 6 Visual Impact Assessment

10. 6. 1 *Introduction*

This visual impact assessment aims at describing potential visual impacts caused by Stage III of the Shenzhen River Regulation Project and sensitive receivers. Sources of the impact will be the construction programme and subsequently design and planning of the project itself. Visual impacts are indicated in Table 10. 4.

10. 6. 2 *Scope of Visual Impact*

The scope of visual impact is indicated at Figure 10. 1. Visual impacts on the following areas are assessed:

- Lo Wu
- Yuan Ling Tsai
- Nam Hang
- Man Kam To
- Muk Wu

10. 6. 3 *Key Visually Sensitive Receivers (VSRs)*

Visually sensitive receivers for each Character Area are indicated in Table10. 4.

VSRs-Character Area No. 1

Key VSRs in the area are as follows (see Figure 10. 39):

- Foot passengers on Lo Wu Bridge;

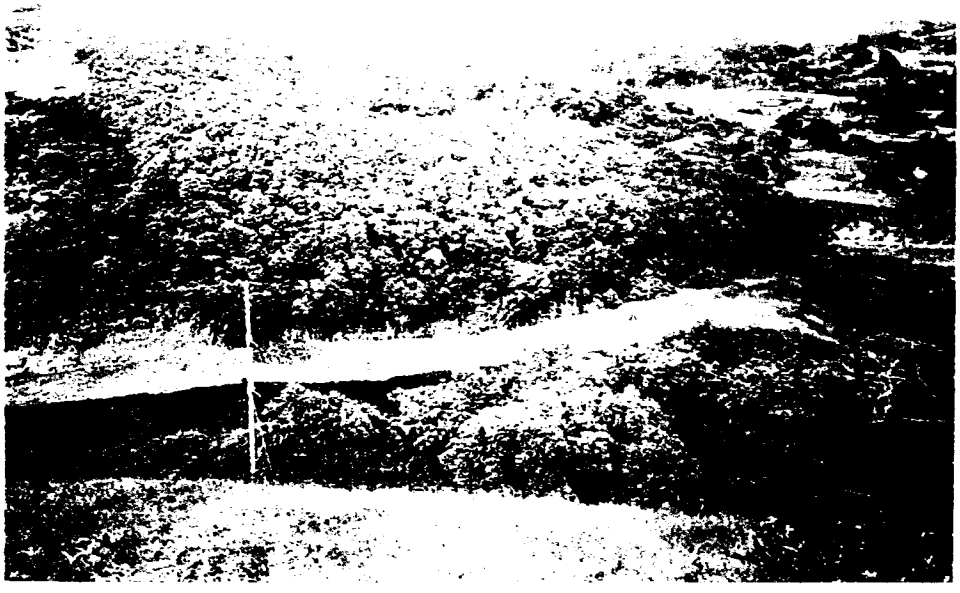


Plate 8. 1 Woodland in Study Area

Plate 8. 2 Shrubland in Study Area

Plate 8. 3 Hillside Grassland in Study Area

Plate 8. 4 Low—lying Grassland in Study Area

Plate 8. 5 Fallow Field in Study Area

Plate 8. 6 Agricultural Land in Study Area

Plate 8. 7 Marshes in Study Area

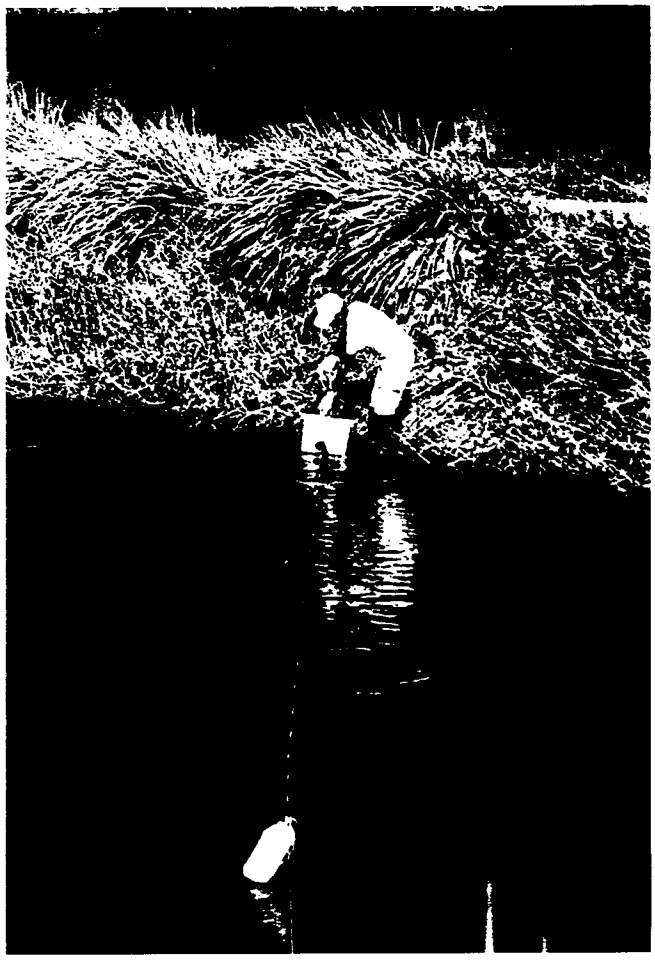


Plate 8. 8 Fishpond in Study Area

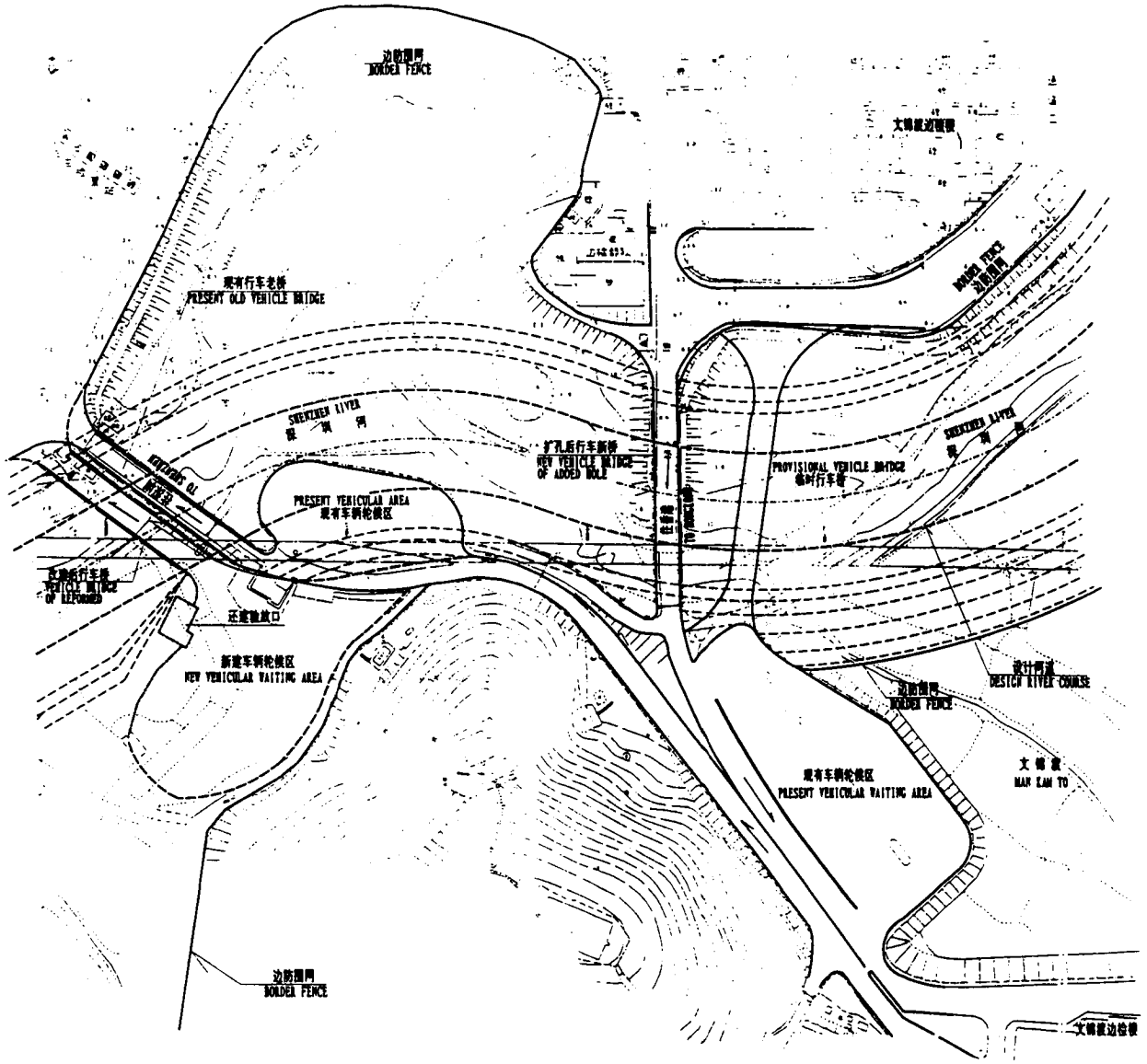
Plate 8. 9 Bloodworm Production Pond in Study Area

Plate 8. 10 A Bend of the Shenzhen River

Figure : 8. 23
Option 6 Recommending the Nam Hang Middle Valley for Spoil Disposal

Legend :

SPOIL DISPOSAL AREA



说明:

行车老桥改建

1. 修建新车辆轮候区.
2. 实施适当的交通管理措施.
3. 在现有行车老桥(往深圳)下游新建行车桥.
4. 往深圳行车道改道至新建行车桥上(永久性).
5. 取消往深圳方向的现有车辆轮候区.
6. 拆除往深圳的现有行车桥.

行车新桥扩孔

1. 在行车新桥上游侧架设临时行车桥.
2. 往香港行车道临时改道至临时行车桥上.
3. 实施适当的交通管理措施.
4. 往香港的现有行车新桥扩孔延长.
5. 将往香港行车道改道回已扩孔延长的行车桥上.
6. 拆除临时行车桥.

NOTES:

OLD VEHICLE BRIDGE OF REFORMED

1. BUILD NEW VEHICULAR WAITING AREA
2. CARRY OUT PROPER TRAFFIC MEASURES
3. BUILD NEW VEHICLE BRIDGE IN THE LOWER REACHES OF PRESENT OLD VEHICLE BRIDGE(TO SHENZHEN)
4. CARRIAGEWAY TO SHENZHEN IS CHANGED TO NEW BUILDING VEHICLE BRIDGE(PERMANENT)
5. CALL OF PRESENT VEHICULAR WAITING AREA TO SHENZHEN
6. PULLDOWN PRESENT VEHICLE BRIDGE TO SHENZHEN

OLD VEHICLE BRIDGE OF REFORMED

1. IN THE UPPER REACHES OF NEW VEHICLE BRIDGE SETTING PROVISIONAL VEHICLE BRIDGE
2. CARRIAGEWAY TO HONGKONG IS CHANGED TO PROVISIONAL BUILDING VEHICLE BRIDGE
3. CARRY OUT PROPER TRAFFIC MEASURES
4. ADDING HOLE PRESENT NEW VEHICLE BRIDGE TO HONGKONG
5. CARRIAGEWAY TO HONGKONG IS CHANGED TO VEHICLE BRIDGE OF ADDED HOLE
6. PULLDOWN PROVISIONAL VEHICLE BRIDGE

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香港宾尼工程顾问有限公司

图 8.24 文锦渡口岸改建老桥,行车新桥扩孔方案平面示意图

FIGURE 8.24 PLANE-PLAN FIGURE REFORM OLD BRIDGE AND NEW BRIDGE ADD HOLE IN MAN KAM TO

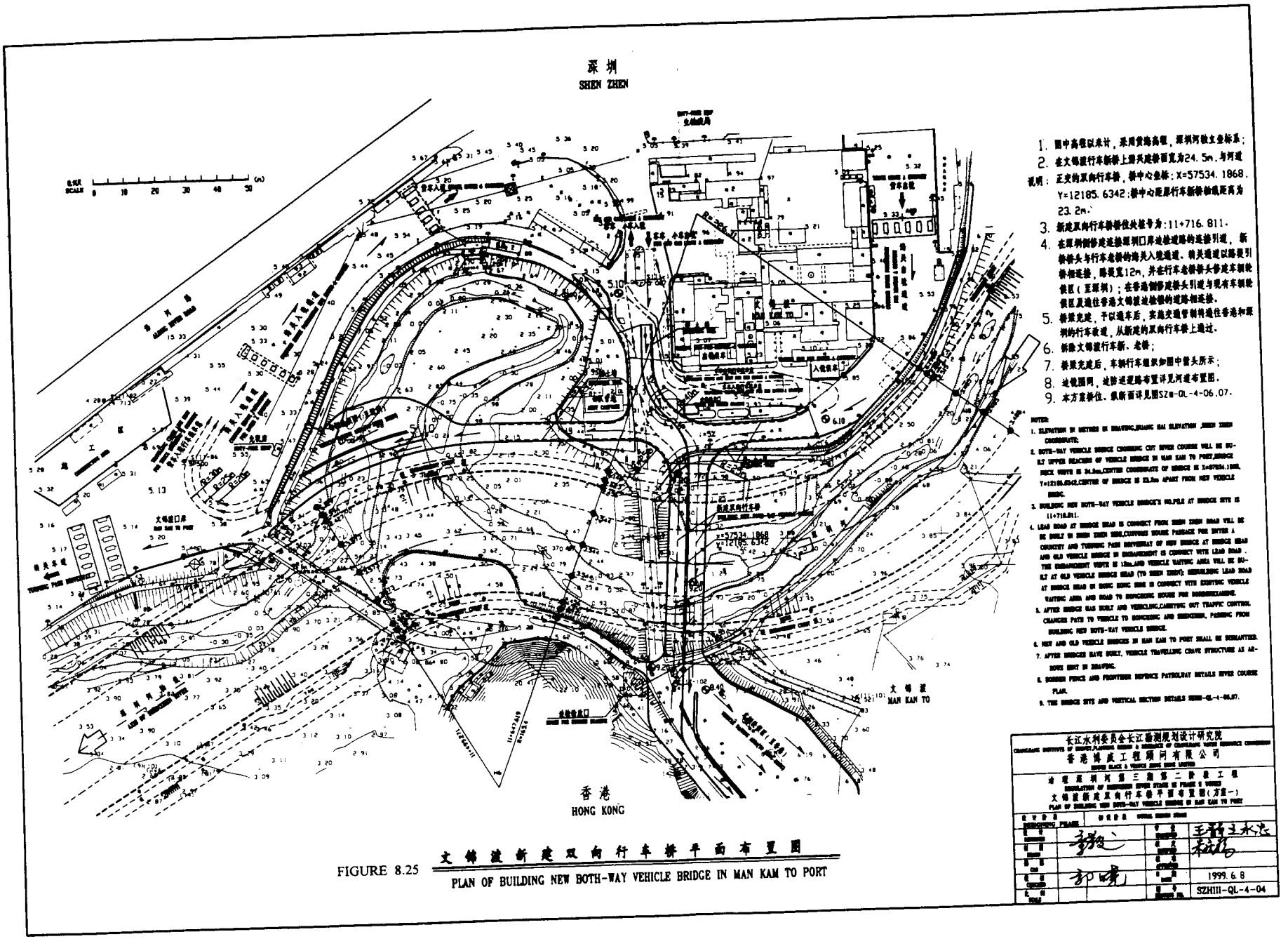


FIGURE 8.25 文锦渡新建双向行车桥平面布置图

PLAN OF BUILDING NEW BOTH-WAY VEHICLE BRIDGE IN MAN KAM TO PORT

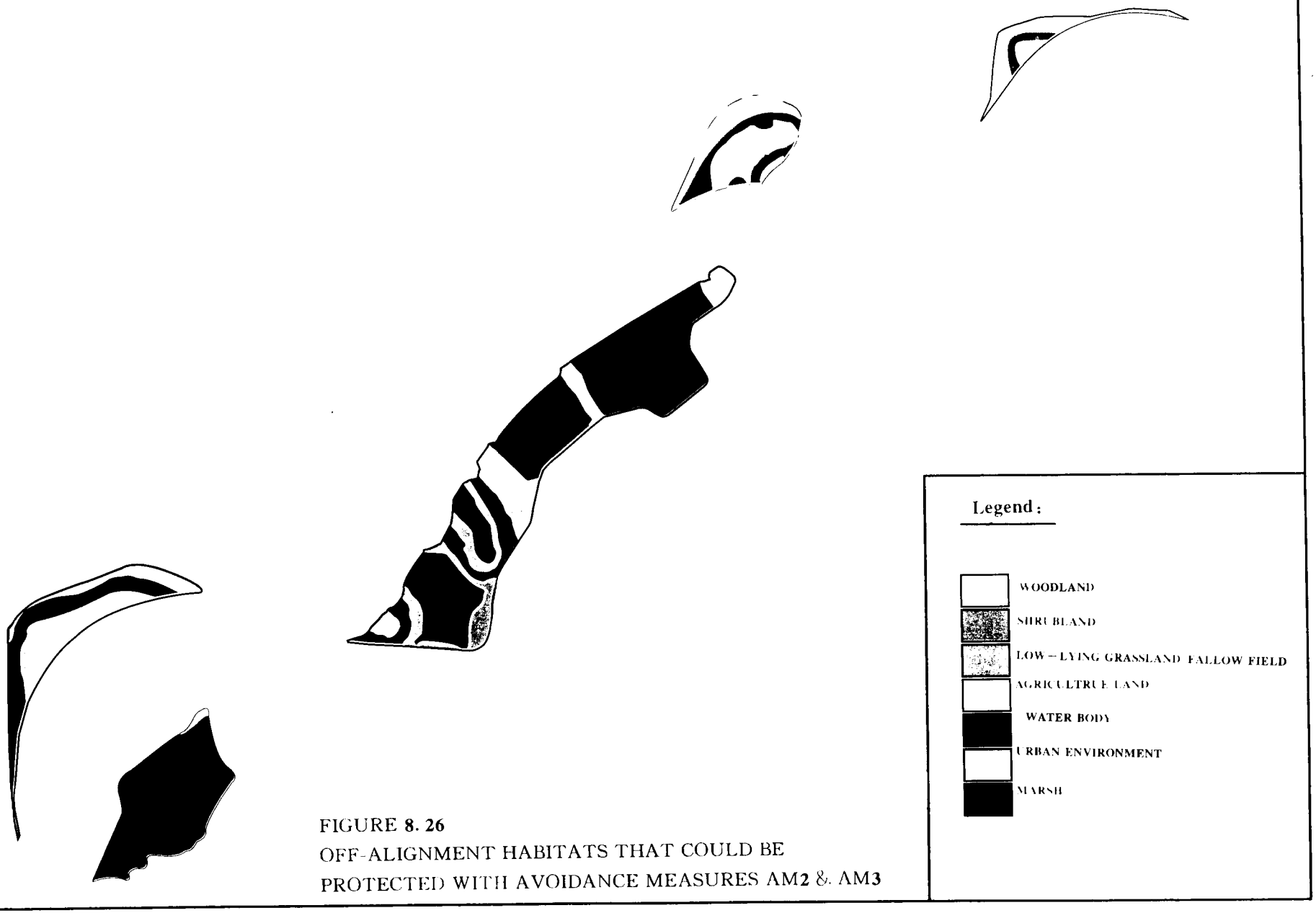
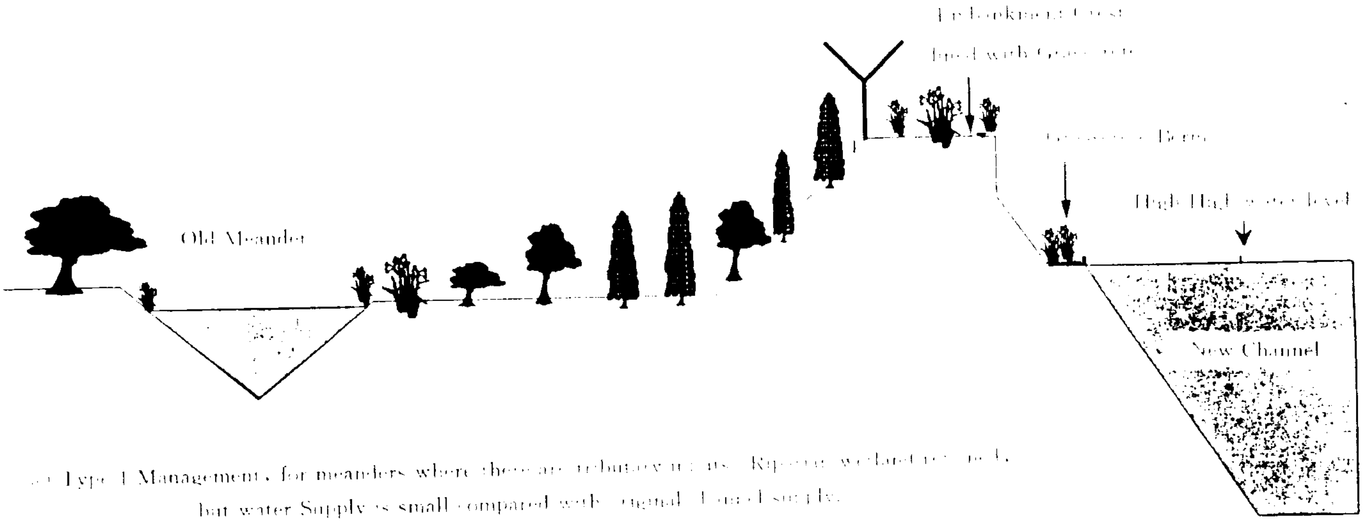
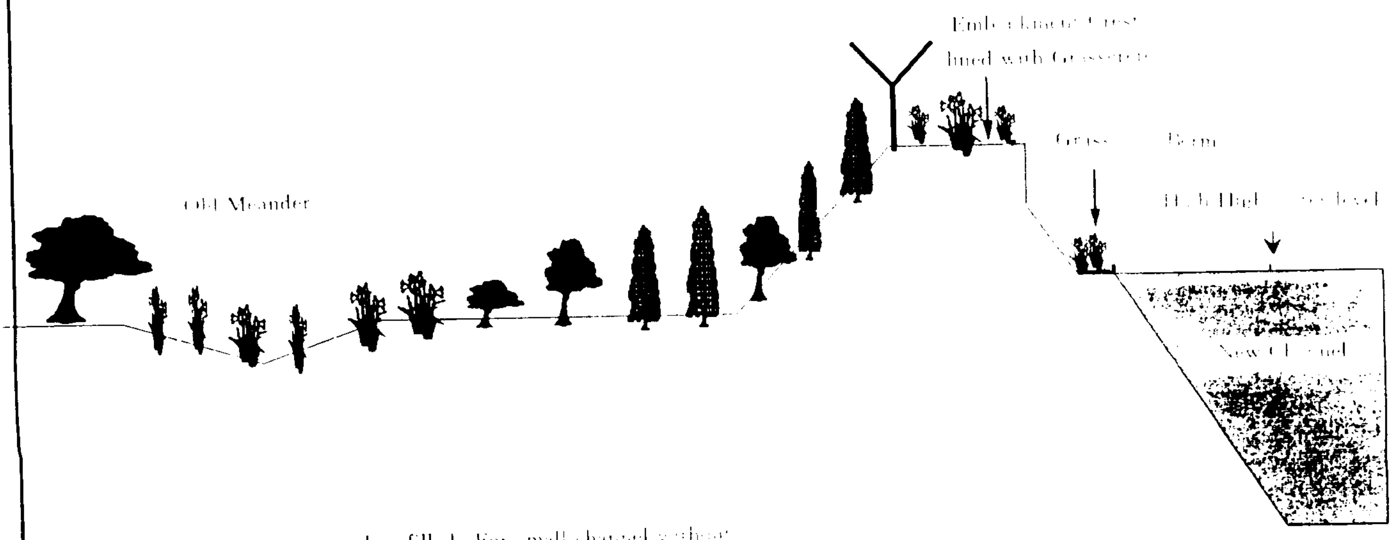


FIGURE **8. 26**
OFF-ALIGNMENT HABITATS THAT COULD BE
PROTECTED WITH AVOIDANCE MEASURES AM**2** & AM**3**

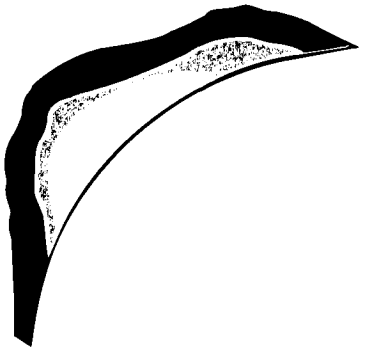


a) Type 1 Management, for meanders where there are tributary inputs. Riparian wetland [illegible] but water Supply is small compared with [illegible]

b) Type [illegible] Management, meanders retained. For [illegible] tributary inputs. The old channel becomes a seasonal wetland



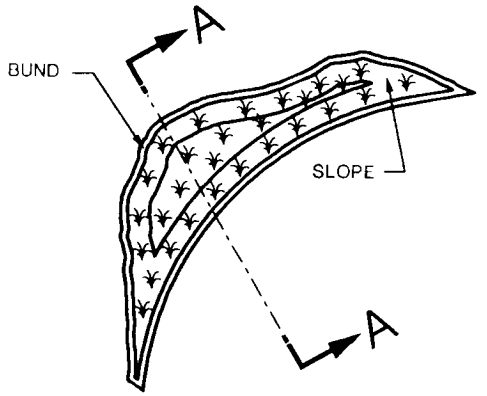
c) Type 3 Management, meanders filled. For small channel [illegible]



PLAN A

MEANDER 1 :

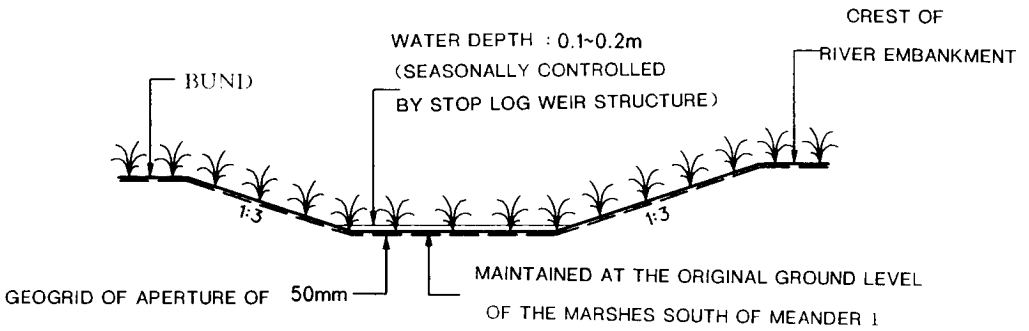
STATUS BEFORE COMMENCEMENT OF THE REGULATION WORKS



PLAN B

PLAN OF THE WARSHCRETE ON

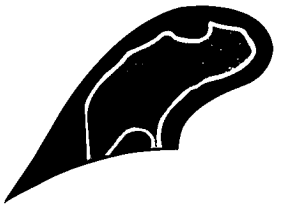
COMPLETION OF THE REGULATION WORKS.



SECTION A—A

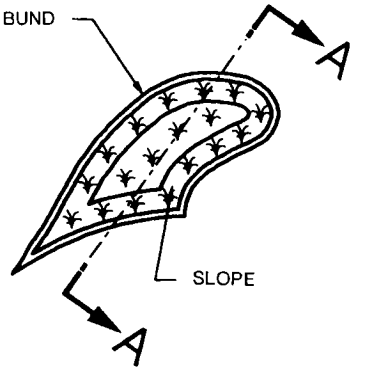
CROSS-SECTION THROUGH THE MARSHCRETE

SHENZHEN RIVER REGULATION STAGE III	Title : RESTORATION OF MEANDER 1 TO MARSHCRETE	Figure No. 8.28	Revision -
		Reference -	File Name 0.0120282.D02
Binnie Black & Veatch Hong Kong Limited 博威工程顧問有限公司		Prepared LWL	Checked RJC
		Date AUG. 99	Scale N.T.S.



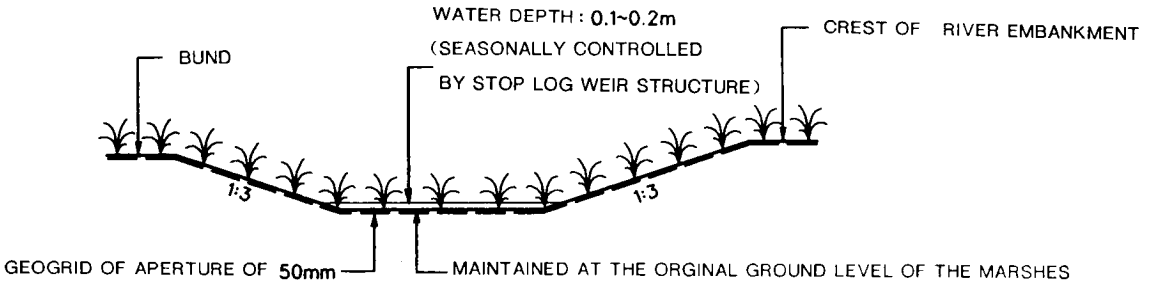
PLAN A

MEANDER 5: STATUS BEFORE COMMENCEMENT OF THE RUGUALTION WORKS



PLAN B

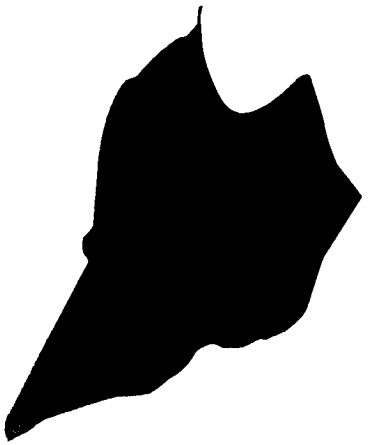
PLAN OF THE MARSHCRETE ON COMPLETION OF THE REGULATION WORKS



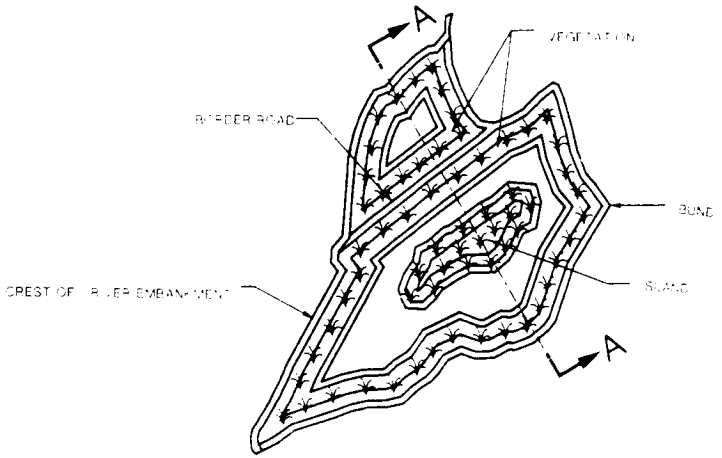
SECTION A—A

CROSS-SECTION THROUGH THE MARSHES

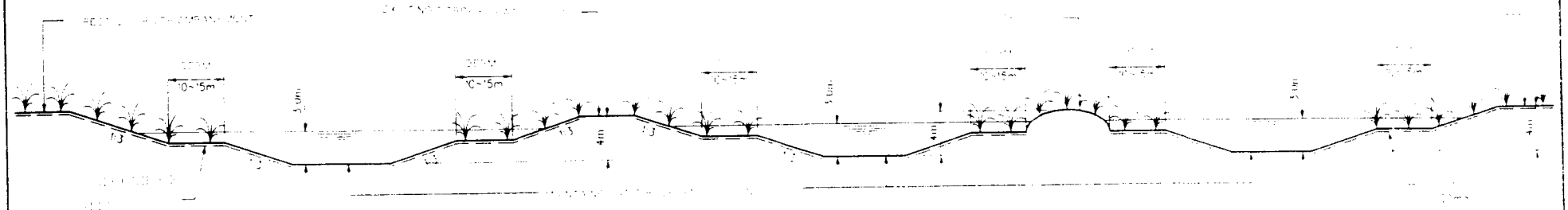
SHENZHEN RIVER REGULATION STAGE III	Title : RESTORATION OF MEANDER 5 TO MARSHCRETE	Figure No. 8.29	Revision -
		Reference -	File Name 00130282.D02
Binnie Black & Veatch Hong Kong Limited 博威工程顧問有限公司 Engineers and Scientists		Prepared LWL	Checked RJC
		Date AUG. 99	Scale N.T.S.



PLAN A



PLAN B



SECTION A - A

SHENZHEN RIVER REGULATION STAGE III	Title: RETORATION OF THE PONDS NORTH OF SANDY RIDGE
Binnie	
Figure No: 8.30	Revision: -
Reference: -	File Name: 00110282.D02
Prepared: LWL	Checked: RJC
Date: AUG. 99	Scale: N.T.S.

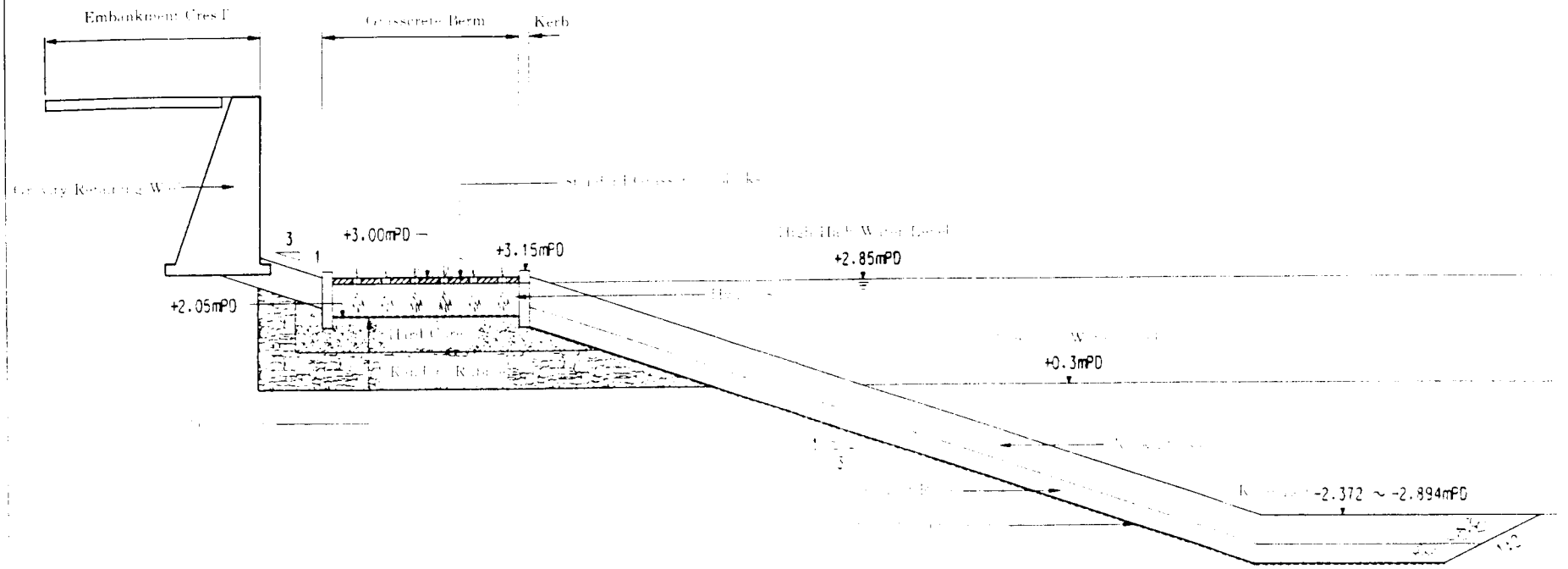


Figure 8.31 Creation of Grasscrete Berms Along the Embankments

LAND DRAINAGE DIVISION

DRAINAGE SERVICES DEPARTMENT

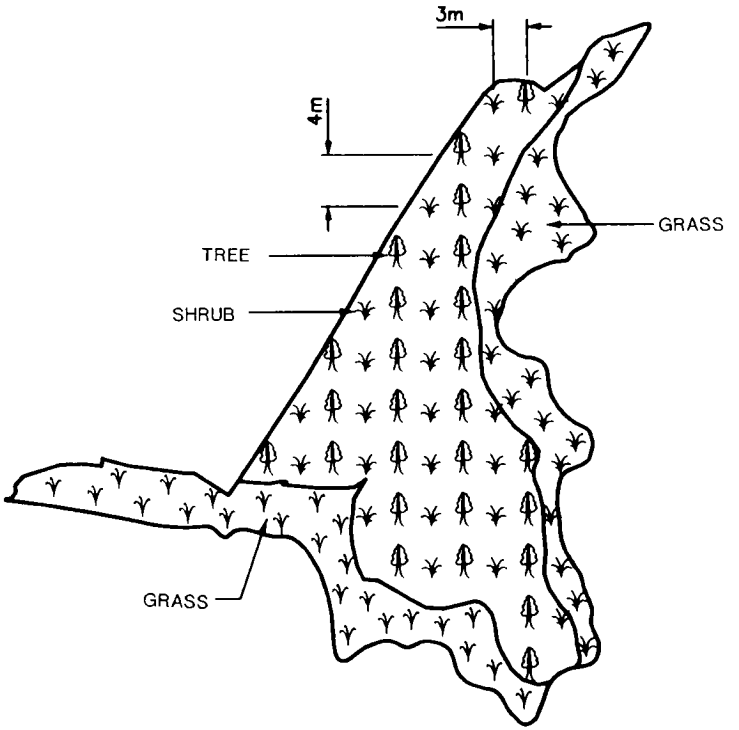
Binnie Black & Veatch Hong Kong Limited

Figure no.	
8.31	
Prepared: YSM	Checked: RJC
Date: 11/99	Scale: 1 : 100

PLAN A

STATUS OF THE NAM HANG MIDDLE VALLEY BEFORE

THE COMMENCEMENT OF THE REGULATION WORKS



PLAN B

PLAN OF THE COMPENSATORY WOODLAND

AT THE NAM HANG MIDDLE VALLEY

SHENZHEN RIVER REGULATION STAGE III	Title : COMPENSATORY WOODLAND AT THE NAM HANG MIDDLE VALLEY	Figure No. 8.32	Revision -
Binnie Black & Veatch Hong Kong Limited 博威工程顧問有限公司 Engineers and Scientists		Reference -	File Name 00140282.D02
		Prepared LWL	Checked RJC
		Date AUG. 99	Scale N.T.S.

Table 10.4 Visual Impact (Refer From Figure 10.39 To Figure 10.46 and Figure 10.51 To Figure 10.54)

Place of Key VSRs	Type of VSRs	Distance of VSRs to Construction site	Main Sources of Impact		Size of Impact		Sensitivity of Receiver	Residual Impact after Mitigating	
			Construction Stage	Operation Stage	Construction Stage	Operational Stage		Construction Stage	Operation Stage
Character Area No. 1 – Lo Wu									
Lo Wu Footbridge	Foot passenger		• Site clearing • Channel excavation • Embankment • Transportation of spoil • Construction equipment in site • Construction net • Reinforced Lo Wu new Footbridge • Rebuilt Lo Wu Railway Bridge • Removed Lo Wu old Footbridge • Construction of newly-built Lo Wu Footbridge • Construction site of bridge • Construction site of perfusion peg	• Newly-built Border Net and Patrol Road • New channel • Dike • Improved Lo Wu new Footbridge • Rebuilt Lo Wu Railway Bridge • Newly-built Lo Wu Footbridge	Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact
Lo Wu Public School Hong Kong	Pupils and teachers	35m			Mid	Low	Mid	Low-negligible negative impact	Low-negligible negative impact and moderate-low positive impact
Lo Wu Border Crossing Shenzhen	Staff	8m			Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact
Lo Wu Border Crossing Hong Kong	Staff	8m			Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact
Lo Wu Tsuen	residents	52m			Mid	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact

Place of Key VSRs	Type of VSRs	Distance of VSRs to Construction site	Main Sources of Impact		Size of Impact		Sensitivity of Receiver	Residual Impact after Mitigating	
			Construction Stage	Operation Stage	Construction Stage	Operational Stage		Construction Stage	Operation Stage
Character Area No. 2- Yuan Ling Tsai									
Dome of Station Terminal	residents	38m	• Site clearing • Excavated channel, bank up • Embankment • Transportation of spoil • Construction equipment • Construction net • Construction bridge • Storage • Concrete mixing round station • Prefabricated component place • Assembled processing plant • Sites for construction machine parking and maintaining	• New Border Net and Patrol Road • New channel • Dike	High	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact
Character Area No. 4 – Man Kam To									
Man Kam To Border Crossing Shenzhen	staff	8m	• Site clearing • Excavated channel, bank up • Embankment • Spoil transportation • Construction equipment	• New Border Net and Patrol Road	Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact
Man Kam To Border Crossing Shenzhen	staff	110m			Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact

Place of Key VSRs	Type of VSRs	Distance of VSRs to Construction site	Main Sources of Impact		Size of Impact		Sensitivity of Receiver	Residual Impact after Mitigating	
			Construction Stage	Operation Stage	Construction Stage	Operational Stage		Construction Stage	Operation Stage
Existent Man Kam To Old Bridge	passenger		• Construction nets • Concrete of both Two Man Kam To Bridge • Construction of newly-built Man Kam To Both-way Bridge • Construction site of bridge • Temporary housing • Temporary park of construction equipment • Processing plant	• New channel • Dike • Newly-built Man Kam To Both-way Bridge	Mid		Low	Low negligible negative impact	
Existent Man Kam To New Bridge	passenger				Mid		Low	Low-negligible negative impact	
Newly-built Man Kam To Bridge	passenger						Low		Low-negligible negative impact
Character Area No. 5 – Muk Wu									
Overseas Chinese New Village Shenzhen	Residents	104m	• Site clearing • Excavated channel • Embankment • Spoil transportation • Construction equipment in site • Construction net • Construction bridge • Storage • Temporary housing • Material stack place • Assembled processing plant • Sites for construction machine maintaining	• New Border Net and Patrol Road • New channel • Dike	Mid	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact
Xinxiu Village Shenzhen	Residents	180m			Mid	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact
Muk Wu Pumping Station Hong Kong	Staff	5m			Mid	Low	Low	Low-negligible negative impact	Low-negligible negative impact
Nga Yiu Tsuen Hong Kong	Residents	73m			Low	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact

Place of Key VSRs	Type of VSRs	Distance of VSRs to Construction site	Main Sources of Impact		Size of Impact		Sensitivity of Receiver	Residual Impact after Mitigating	
			Construction Stage	Operation Stage	Construction Stage	Operational Stage		Construction Stage	Operation Stage
Muk Wu Tsuen	residents	108m	• machine maintaining temporary park of construction equipment		Low	Low	High	Moderate-low negative impact	Moderate-low negative impact and positive impact

Annotati: "distance of VSRs to construction site" in the table is the least distance from out border of VSRs to out border of construction site (construction net).

- Pupils and teachers at Lo Wu Public School;
- Parts of residents of Lo Wu Tsuen;
- Staff of border-control station and Customhouse.

VSRs-Character Area No. 2

Key VSRs in the area are as follows (see Figure 10.40):

- Residents living in the dormitory of the Station Terminal and Lo Wu Fourth Village of Shenzhen city.

VSRs-Character Area No. 3

There is no VSRs in this area.

VSRs-Character Area No. 4

Key VSRs in this area are as follows (see Figure 10.41):

- Staff of Man Kam To Border Crossing of Shenzhen;
- Staff of Man Kam To Border Crossing of Hong Kong;
- Bus passengers on Man Kam To Bridge.

VSRs-Character Area No. 5

Key VSRs in this area are as follows (see Figure 10.42):

- Residents of Huaqiao New Village of Shenzhen city;
- Residents of Xinxiu Village of Shenzhen city;
- Residents of Muk Wu Tsuen of Hong Kong;
- Residents of Nga Yiu Tsuen of Hong Kong;
- Staff of Muk Wu Pumping Station of Hong Kong.

10.6.4 *Sources of Visual Impacts*

Construction Stage

The following general sources of visual impacts in the construction stage will apply to all areas of the project:

- Site clearing;
- Excavation of the river channel;
- Embankment;
- Transportation of the spoil;
- Construction equipment in the site;
- Site fence.

Character Area No. 1

Specific sources of visual impact on key VSRs in the Character Area No. 1 within construction stage will include:

- Strengthening of Lo Wu New Footbridge;
- Reconstruction of Lo Wu Railway Bridge;
- Demolition Lo Wu Old Footbridge;
- Reconstruction of Lo Wu Old Footbridge;
- Bridge construction sites;
- Pile construction sites.

Character Area No. 2

Specific sources of visual impact on key VSRs in the Character Area No. 2 within construction stage will include:

- Construction bridge;
- Material and equipment storages;
- Concrete mixing stations;
- Precast component store yard;
- Assembled processing plants;
- Construction machine parking and maintaining sites.

Character Area No. 4

Specific sources of visual impact on key VSRs in the Character Area No. 4 within con-

struction stage will include:

- Demolition of Man Kam To New/Old Bridges;
- Construction of Man Kam To Two-way vehicular Bridge;
- Bridge construction sites;
- Temporary housing;
- Area for temporary parking of construction equipment;
- Processing plants.

Character Area No. 5

Specific sources of visual impact on key VSRs in the Character Area No. 5 within construction stage will include:

- Construction bridge;
- Warehouses;
- Temporary housing;
- Material storage site;
- Assembled processing plant;
- Construction machine parking and maintaining sites;
- Area for temporary parking of construction equipment.

Operation Stage

The following general sources of visual impacts in the operation stage will apply to all areas of the project:

- New border fence and Border Patrol Roads;
- New river course;
- Dike.

Character Area No. 1

Specific sources of visual impact on key VSRs in the Character Area No. 1 within construction stage will include:

- Strengthen Lo Wu New Footbridge;
- Rebuilt Lo Wu Railway Bridge;
- Rebuilt Lo Wu Old Footbridge.

Character Area No. 2

There are no specific sources of visual impact in this area.

Character Area No. 3

There are no specific sources of visual impact in this area.

Character Area No. 4

Specific sources of visual impact on key VSRs in the Character Area No. 4 within construction stage will include:

- Man Kam To Two-way Vehicular Bridge.

Character Area No. 5

There are no specific sources of visual impact in this area.

10.6.5 *Prediction and Evaluation of Visual Impact*

Construction stage

Character Area No. 1

Visual impact in construction stage is illustrated at Figure 10.39 and listed at Table 10.4..

Strengthening of Lo Wu New Footbridge mainly aims at treating the foundation of the bridge. With the shelter from surrounding structures, it is predicted that no impact will be exerted on sensitively visual receivers.

Reconstruction Lo Wu Old Footbridge will has a moderate negative impact on foot passengers on Lo Wu New Footbridge and staff of border crossing control agencies of both sides.

Construction of Lo Wu Railway Bridge will has a moderate negative impact on foot passengers on Lo Wu New Footbridge and staff of border crossing control agencies of both sides.

Construction activities, such as site clearing, excavation of river channel, construction of banks, transportation of construction materials and spoil, operation of construction equipment and site fence, will be a moderate negative impact on all sensitively visual receivers.

Character Area No. 2

Visual impact in construction stage is illustrated at Figure 10. 40 and listed in Table 10. 4.

Construction activities, such as site clearing, excavation of river channel, construction of banks, spoil disposal, transportation of construction materials and spoil, operation of construction equipment and site fence, will be a high negative impact on all sensitively visual receivers.

The followings will cause a high negative impact on all sensitively visual receivers: construction bridge; material and equipment storage; concrete mixing station; prefabricated component store sites; assembled processing plants and construction machine parking and maintaining sites.

Character Area No. 3

There is no specific visual impact in this area except the general visual impact in operation stage.

Character Area No. 4

Visual impact in construction stage is illustrated in Figure 10. 41 and listed in Table 10. 4.

The removal of new and old Man Kam To Bridges will produce a moderate negative impact on all sensitively visual receivers.

Construction activities, such as site clearing, excavation of river channel, construction of banks, transportation of construction materials and spoil, operation of construction equipment and site fence, will have a high negative impact on all sensitively visual receivers.

The following objects will cause a moderate negative impact on all sensitively visual receivers: temporary housing; area for temporary parking of construction equipment; processing plant.

Character Area No. 5

Visual impact in construction stage is illustrated Figure 10. 42 and listed in Table 10. 4.

The followings will pose a moderate negative impact on the staff of Muk Wu Pumping Station, residents of Huaqiao New Village and Xinxiu Village of Shenzhen city: site clearing; excavation of the river channel; construction of banks; transportation of construction materials and spoil; construction equipment in the site; site fence; construction bridge; material and equipment storage; temporary housing; material store sites; assembled processing plants; construction machine parking and maintaining sites.

Construction site will have low negative impact on residents at Nga Yiu Tsuen Hong Kong because they are far from the site and their houses are small and surrounded by the forest.

Negative impact of construction site is insignificant because the sight of residents at Muk Wu Tsuen is far away from the site.

Operation Stage

Visual impact in operation stage is illustrated from Figure 10. 43 to Figure 10. 46 and listed in Table 10. 4. Which should mainly include:

After the sediment in the original river channel is dredged, new river course will show a favorable sight feeling on all VSRs. Widened new river course has also a positive impact on all VSRs because the sight of all VSRs become wider.

New river course will be lined with precast concrete and block stones, forming a man-made channel, which has a low negative impact because its vision is not so good as the original river channel with green vegetation.

The border fence and border patrol roads have already been there before this project, and the new border fence and roads are only moved slightly backward because of widening of the river channel, therefore, they are not newly increased visual barriers. However, the reconstructed border fence and roads are closer to VSRs, this will have a low negative impact on VSRs.

Newly-built riverbanks have a low negative impact because they form low visual barriers to VSRs.

Visual impacts of each Area in the operation stage are as follows:

Character Area No. 1

Reconstruction of existing Lo Wu New Footbridge and Railway Bridge should not cause negative visual impact.

After existing Lo Wu Old Footbridge is removed, newly-built Lo Wu Footbridge will not be a visual barrier, because it is just a replacement of the existing Lo Wu Old Footbridge, with its location slightly at upstream. Therefore, the negative visual impact is insignificant.

Visual impacts of Character Area No. 1 in the operation stage is illustrated from Figure 10.43

After mitigation measures, such as planting grasses on the berm and liane on the top of the riverbank, are adopted in the construction stage, passengers walking on the newly-built Lo Wu Footbridge will have a better visual feeling than before. Therefore, the project will exert no significant negative impact on transit passengers.

Newly built border fence and border patrol roads is nearer to the dormitory of the Station, which has low negative visual impact on the resident of the dormitory.

Character Area No. 4

After the existing Man Kam To New Bridge is removed, a new Man Kam To Two-way Vehicular Bridge will be built at 15 m upstream. It should have no negative visual impact because no visual barrier is increased.

10.6.6 *Visual Mitigation Measures*

The visual mitigation measures proposed below seek to minimize potential visual impacts of the project.

The visual mitigation measures are illustrated from Figure 10.47 to Figure 10.50.

Construction Stage

- Designed nicely and constructed exactly to reduce losses of woodland, grassland, pond and marsh as far as possible;
- Haul roads for transportation of spoil must be as far away from VSRs as possible;
- All machines and vehicles parked temporarily should be laid in order;
- All construction materials must avoid being stacked in the open air if possible;
- Aesthetic requirement must be considered in designing and building all the tempo-

rary establishments, such as housing, storage and processing plant;

- When construction is finished, all temporary construction establishments must be removed in each construction area, and the construction used land be restored to original usage. If restoration is impossible, trees and greensward must be planted to beautify the landscape;
- For river reach with vertical wall cross-section, liane will be planted on the dyke crests to cover the surfaces of the vertical walls; for other river reachs, grasscrete will be established on the platforms of the new river channel to minimize negative visual impact caused by new river course;
- According to suggestions put forward in Chapter 8, reform the cut-off old river meander area into ponds and marshes and plant native riparian trees there;
- Plant greensward on the newly-built banks.

Operation Stage:

Visual impacts caused by newly-built border patrol roads and border fence, newly-built riverbanks and newly-built bridges are unavoidable. For the visual impact caused by dredging of the river channel, mitigation measures will have been taken in construction stage, therefore, no special mitigation measure is necessary in the operation stage.

When the construction starts in each construction area of the project, the corresponding mitigation measures to visual impacts must be taken at the same time. When construction is finished, the mitigation measures to visual impacts must also be taken.

Contractors of the project are responsible for the implementation of all visual mitigation measures, and the cost must be listed into the project expenditure. The planted trees, greensward, and restored ponds and marshes for mitigating landscape impacts are to be managed by Agriculture, Fishenies and Conserlation Departmant on the Hong Kong side, and by related governmental department on the Shenzhen side.

10.6.7 *Residual Landscape Impact*

A residual visual impact is defined as a negative impact that cannot be mitigated after all practical methods of mitigation have been implemented.

Residual visual impacts are illustrated in Table 10.4 and Figure 10.51 to Figure 10.54.

Construction Stage

Residual visual impacts in the construction stage should include:

Construction activities, such as site clearing, excavation of river channel, construction of banks, transportation of construction materials and spoil, operation of construction equipment and site fence, will have a low negative impact on all sensitively visual receivers.

Reconstruction Lo Wu Old Footbridge will has a moderate negative impact on foot passengers on Lo Wu New Footbridge and staff of border crossing control departments of both sides.

Construction of Lo Wu Railway Bridge will has a moderate negative impact on foot passenger on Lo Wu New Footbridge and staff of border crossing control departments of both sides.

Construction will has a moderate negative impact on staff of border crossing control departments of both sides during the removing period of Man Kam To New/Old Bridges and the construction period of Man Kam To Two-way Vehicular Bridge.

Operation Stage

In the operation stage, residual visual impacts mainly include:

Newly-built riverbanks has a low negative impact on VSRs because of low visual barrier; newly-built border fence and border patrol roads have a low negative impact on VSRs because they are closer to VSRs.

10.7 Requirements for Environmental Monitoring and Audit

Environmental monitoring and audit must be adopted in order to ensure the minimization of landscape and visual impacts. Requirements of environmental monitoring and audit are as follows.

10.7.1 *Supervision in Construction Site*

Supervision in the construction site is to frequently make on-the-spot inspection, to supervise contractors' implementation of landscape and visual mitigation measures. Work of the supervisors must include:

Asking contractors to restrict their workers not to trample grassland randomly and not to destroy trees to reduce the loss of vegetation at best.

During site clearing before the construction starts formally, supervising contractors to replant trees to other proper places.

When contractors design and build temporary construction establishments, reminding contractors to consider outline beauty.

Scouting the construction site frequently within the construction stage, reminding contractors to make temporarily parked machines and vehicles park in order, not to stack construction materials randomly, to cover ugly matters to the best of one's abilities. Supervising and urging contractors to improve when their performances are not satisfactory.

When construction has been finished in each construction area, supervising and urging contractors to remove all temporary construction establishments, to restore original usage of the construction occupied land. If restoration is impossible, plant trees and greensward to improve local landscape.

10.7.2 *Monitoring the Effectiveness of Landscape and Visual Mitigation Measures*

Monitoring the effectiveness of landscape and visual mitigation measures mainly covers monitoring the effects of all compensation and restoration measures. Thereinto, the monitoring on compensation and restoration of pond, marsh and vegetation for requirements of ecological protection have been included in the ecological monitoring. Therefore, they are not included here. As such, the emphases are placed on monitoring the effects of construction occupied land restoration by planting trees and greensward. Monitoring parameters include livability of trees and greensward, planting density, highness of the plant and vegetation coverage rate (%). If livability and planting density cannot meet requirement, requiring contractors to replant.

Landscape and visual mitigation measures are listed into Table 10.5.

10.8 Conclusion

10.8.1 *Character Area No. 1*

Landscape Impact

Landscape impacts are listed in Table 10.3.

Losses of landscape resources caused by the project are very low and can be compen-

Table 10.5 Landscape and Visual Mitigation Measures

Landscape
Executor: Contractors Executing time: Construction stage Maintenance: Shenzhen River Regulation Office
(1) **Measures needed by Shenzhen side:** Designed nicely and constructed exactly to reduce losses of woodland, grassland, pond and marsh to the maximum degree. When construction has been finished, temporary construction establishments must be removed in each construction area, and original usage or vegetation must be restored for the construction occupied land. Reform the cut-off old river meander area into ponds and marshes and plant native riparian trees there to compensate for environment losses. Restoration of construction occupied land: original usage must be restored for temporarily used land, and trees and grasses must be planted on permanently occupied land when construction has been finished. Trees and shrubs are arranged in the style of 2 shrubs between every 2 trees, the distance between every two individuals, no matter what tree or shrub, is 2 m. The selected tree species must be suitable to local conditions. Other open space will be covered with greensward. Establish grasscrete on the berm of the new river embankment. Plant greensward on newly-built banks.

Table 10.5 Landscape and Visual Mitigation Measures (Cont'd)

Landscape
Executor: Contractors Executing time: Construction stage Maintenance: AFCD
(2) **Measures needed by Hong Kong side:** Designed nicely and constructed exactly to reduce losses of woodland, grassland, pond and marsh to the maximum degree. When construction has been finished, temporary construction establishments must be removed in each construction area. Restore vegetation on the spoil disposal site when spoil disposal has been finished. Restoration of construction used land: plant trees and grasses to restore the vegetation when construction has been finished. Trees and shrubs are arranged in the style of 2 shrubs between every 2 trees, the distance between every two individuals, no matter what tree or shrub, is 2 m. The selected tree species must be suitable to local conditions. Other open space will be covered with greensward. Replant trees to suitable sites: replant construction-affected trees to the cut-off old meander area. Restore project-affected ponds. Establish grasscrete on the berm of the new river embankment (to be maintained by DSD). Plant greensward on the newly-built banks.

Note: "Shenzhen side" and "Hong Kong side" in Table 10.5 mean Shenzhen side and Hong Kong side of new river course, and the meaning is different from "Shenzhen side" and "Hong Kong side" based on existent river channel. It has no implication with land property.

Table 10.5 Landscape and Visual Mitigation Measures (Cont'd)

Visual
Executor: Contractors Executing time: Construction stage Maintenance: Shenzhen River Regulation Office
(1) **Measures needed by Shenzhen side:**
Designed nicely and constructed exactly to reduce losses of woodland, grassland, pond and marsh to the maximum degree.
When construction has been finished, temporary construction establishments must be removed in each construction area, and original usage or vegetation must be restored.
Restoration of construction used land: to be performed referring to landscape mitigation measures.
The road used by transportation of spoil must be as away from VSRs as possible.
Machines and vehicles parked temporarily must be parked in order.
When temporary construction establishments, such as housing, storage and processing plant, are designed and built, aesthetic requirements must be considered.
Establish grasscrete on the berm of the new river embankment.
Plant greensward on the newly-built banks.
Reform the cut-off old river meander area into ponds and marshes and plant native riparian trees there.

Table 10.5 Landscape and Visual Mitigation Measures (Cont'd)

Visual
Executor: Contractors Executing time: Construction stage Maintenance: AFCD
(2) **Measures needed by Hong Kong side:**
Designed nicely and constructed exactly to reduce losses of woodland, grassland, pond and marsh to the maximum degree.
When construction has been finished, temporary construction establishments must be removed in each construction area.
Restoration of construction used land: to be performed referring to landscape mitigation measures.
The road used by transportation of spoil must be as far away from VSRs as possible.
Machines and vehicles parked temporarily must be parked in order;
When temporary construction establishments, such as housing, storage and processing plant, are designed and built, aesthetic requirements must be considered.
Establish grasscrete on the berm of the new river embankment (to be maintained by DSD).
Plant greensward on the newly-built banks.

Note: "Shenzhen side" and "Hong Kong side" in Table 10.5 mean Shenzhen side and Hong Kong side of new river course, and the meaning is different from "Shenzhen side" and "Hong Kong side" based on existent river channel. It has no implication with land property.

sated, moreover, negative impacts of the project on landscape character are also very low and can be eliminated by taking mitigation measures.

Construction of the project has moderate negative impacts on landscape character, but it is only limited within construction stage. Negative landscape impacts in operation stage are mainly because the natural river channel is modified due to lining of the river channel. In addition, the Newly-built riverbanks have a low negative impact because it changes landscape character.

Visual Impact

Visual impacts are listed in Table 10.4.

In construction stage of the project, rebuilding the Lo Wu Old Footbridge and the Lo Wu Railway Bridge will have a moderate negative impact on foot passengers on the new Lo Wu footbridge and the staff of the border crossing control departments of both sides. Construction activities, such as site clearing, excavation of river channel, construction of the banks, transportation of construction materials and spoil, operation of construction equipment, and site fence, will have moderate negative impacts on all sensitively visual receivers.

In the operation stage of the project, negative visual impacts should mainly include: as newly-built border fence and border patrol roads are closer than before to Shenzhen city, Lo Wu Tsuen and Lo Wu Public School, they will have low negative visual impacts on residents of Lo Wu Tsuen of Hong Kong and Shenzhen City, and pupils and teachers of Lo Wu Public School; after the existing Lo Wu Old Footbridge is removed, a new one will be built a little upper, it is expected that visual impacts of this modification will be negligible; newly-built riverbanks will have low negative visual impacts on VSRs because of its low visual barrier.

Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage. However, negative landscape and visual impacts within operation stage is low. In summary, negative landscape and visual impacts caused by the project in the area are acceptable after mitigation measures are taken.

10.8.2 *Character Area No. 2*

Landscape Impact

Landscape impacts are listed in Table 10.3.

In construction stage, excavation of the river channel, embankment and temporary construction site will occupy ponds, marshes, farmland, woodland and low-lying grassland, thus causing losses of landscape resources. But after the project is finished, the occupied land will be changed into new river channel, forming additional water surface and new landscape resources. However, excavation and lining of the new river channel and embankment will cause moderate negative impacts on landscape character. In addition, a large amount of construction occupied land will become bared ground when construction is finished, it will cause high negative impacts on landscape character. But, after mitigation measures are taken, landscape and visual impacts can be compensated. The compensation will mainly be embodied by the followings: the new river course will form good landscape character; the riverbanks will be virescent; original usage or vegetation will be restored for the construction occupied land; the cut-off meanders will be reformed into marsh; and native trees will be planted in the river meander area. Therefore, negative impacts of the project will be very insignificant.

In operation stage, negative impact on river channel landscape is mainly that natural river channel is changed into man-made lined one. But the negative impact can be mitigated by planting grasscrete on the berm of the new river channel, and liane on the crest of the river embankment. When the project is finished, the new river course will be straighter than the old one, and the newly-built riverbanks will also change landscape character, these will cause negative impacts on landscape, however, the impacts are insignificant.

On the first day of the operation stage, quality of landscape resources compensated within construction stage cannot reach original level. It still has low negative impacts. After ten years later, quality of landscape resources compensated within construction stage can reach original level, then, negative landscape impacts can be ignored.

Visual Impact

Visual impacts are listed in Table 10.4.

In the construction stage, construction activities or associated objects, such as site clearing, excavation of the river channel, construction of embankment, transportation of construction materials and spoil, construction equipment and site fence, construction bridge, materials and equipment storage, concrete mixing, prefabricated component storing yard, assembled processing and construction machines maintaining sites, will have high negative impacts on residents of Lo Wu Fourth Village of Shen-

zhen and those living in the dorm of border check terminals. Moderate negative impacts will still be expected even if mitigation measures are taken.

In the operation stage of the project, negative visual impacts should mainly include: newly-built border fence and roads is closer to Lo Wu Fourth Village of Shenzhen and the dorm of Man Kam To border check terminal, thus having low negative visual impacts on residents at Lo Wu fourth Village of Shenzhen and the dorm of Man Kam To border check terminal. But, the newly-built riverbanks will have low negative visual impacts on VSRs because of its low visual barrier.

Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage. However, negative landscape and visual impacts within operation stage are low. In summary, negative landscape and visual impacts caused by the project in the area are acceptable after mitigation measures are taken.

10.8.3 *Character Area No. 3*

Landscape Impact

Landscape impacts are listed in Table 10.3.

In construction stage, excavation of the river channel, embankment, spoil and temporary construction site will occupy pond, marsh, farmland, woodland and low grassland, causing a loss of landscape resources. But after the project is finished, the occupied land will be changed into new river course, forming additional water surface and new landscape resources. However, excavation and lining of the new river channel and embankment will cause moderate negative impacts on landscape character. In addition, a large amount of construction occupied land will become bared ground when construction is finished, it will cause high negative impacts on landscape character. But, after mitigation measures are taken, landscape and visual impacts can be compensated. The compensation will mainly be embodied by the followings: the new river course will form good landscape character; the riverbanks will be virescent; original usage or vegetation will be restored for the construction occupied land; the spoil sites will be restored with vegetation; the cut-off meanders will be reformed into marsh; and native trees will be planted in the river meander area. Therefore, negative impacts of the project will be very insignificant.

In operation stage, negative impact on river channel landscape is mainly that natural river channel is changed into man-made lined one. But the negative impact can be mi-

tigated by planting grasscrete on the berm of the new river embankment, and liane planted on the crest of the river embankment. When the project is finished, the new river course will be straighter than the old one, and the newly-built riverbanks will also change landscape character, these will cause negative impacts on landscape, however, the impacts are insignificant.

On the first day of the operation stage, quality of landscape resources compensated within construction stage cannot reach original level, and it will still have low negative impacts. But, after ten years, quality of the compensated landscape resources can reach original level, and then, negative landscape impacts can be negligible.

Visual Impact

Visual impacts are listed in Table 10.4.

As there is no VSR in the area, assessment of visual impact is unnecessary.

Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage. However, negative landscape and visual impacts within operation stage is low. In summary, negative landscape and visual impacts caused by the project in the area are acceptable after mitigation measures are taken.

10.8.4 *Character Area No. 4*

Landscape Impact

Landscape impacts are listed in Table 10.3.

In construction stage, excavation of the river channel, embankment and temporary construction site will occupy marsh and low-lying grassland, causing a loss of landscape resources. But after the project is finished, the occupied land will be changed into new river course, forming additional water surface and new landscape resources. However, excavation and lining of the new river channel and embankment will cause moderate negative impacts on landscape character. In addition, a large amount of construction occupied land will become bared ground when construction is finished, it will cause low negative impacts on landscape character. Construction activities of removing Man Kam To New/Old Bridges and rebuilding Man Kam To Two-way Bridge will cause moderate-low negative impacts on landscape character. After mitigation measures are taken, new river course will form good landscape character: the riverbanks will be virescent; original usage or vegetation will be restored for construction

occupied land; the cut-off meanders will be reformed into marsh to compensate for the loss of landscape resources.

In operation stage, negative impact on river channel landscape is mainly that natural river channel is changed into man-made lined one. When the project is finished, the new river course will be straighter than the old one, and the newly-built riverbanks will also change landscape character, these will cause negative impacts on landscape, however, the impacts are insignificant.

On the first day of the operation stage, quality of landscape resources compensated within construction stage cannot reach original level, and it will still have low negative impacts. But, after ten years, quality of the compensated landscape resources can reach original level, and then, negative landscape impacts can be negligible.

Visual Impact

Visual impacts are listed in Table 10.4.

In the construction stage, construction activities of removing Man Kam To New/Old Bridges and rebuilding Man Kam To Two-way Bridge will cause moderate negative impacts on the staff of the border crossing control departments both sides. Other activities or associated objects, such as site clearing, excavation of the river channel, construction of embankment, transportation of construction materials and spoil, construction equipment in the site, site, temporary housing, temporary park of construction equipment, will have moderate negative impacts on VSRs. But after mitigation measures are taken, the above-mentioned negative impacts can be decreased to a lower level.

In the operation stage of the project, negative visual impacts should be mainly that newly-built riverbanks have low negative visual impacts on VSRs because of its low visual barrier.

Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage and are low in magnitude. But, landscape and visual impacts within operation stage are mainly positive. In summary, negative landscape and visual impacts caused by the project in the area are acceptable after mitigation measures are taken.

10.8.5 *Character Area No. 5*

Landscape Impact

Landscape impacts are listed in Table 10.3.

In construction stage, excavation of the river channel, embankment and temporary construction site will occupy pond, marsh, woodland and low-lying grassland, causing a loss of landscape resources. But after the project is finished, the occupied land will be changed into new river course, forming additional water surface and new landscape resources. However, excavation and lining of the new river channel and embankment will cause moderate negative impacts on landscape character. In addition, a large amount of construction occupied land will become bared ground when construction is finished, it will cause low negative impacts on landscape character. After mitigation measures are taken, new river course will form good landscape character: the riverbanks will be virescent; original usage or vegetation will be restored for construction occupied land; the cut-off meanders will be reformed into marsh to compensate for the loss of landscape resources. Therefore, negative impacts of the project will be very low.

In operation stage, negative impact on river channel landscape is mainly that natural river channel is changed into man-made lined one. When the project is finished, the new river course will be straighter than the old one, and the newly-built riverbanks will also change landscape character, these will cause low negative impacts on landscape.

On the first day of the operation stage, quality of landscape resources compensated within construction stage cannot reach original level, and it will still have low negative impacts. But, after ten years, quality of the compensated landscape resources can reach original level, and then, negative landscape impacts can be negligible.

Visual Impact

Visual impacts are listed in Table 10.4.

In the construction stage, construction activities or associated objects, such as site clearing, excavation of the river channel, construction of embankment, transportation of construction materials and spoil, construction equipment in the site and site fence, bridge construction, temporary housing, materials stack place, assembled processing plant, construction machines maintaining site and temporary park of construction equipment, will have moderate negative impacts on the staff of Muk Wu Pumping

Station, residents at Huaqiao New Village and Xinxiu Villages of Shenzhen. Besides, they will also have low negative impacts on residents at Muk Wu and Nga Yiu Tsuens of Hong Kong. After mitigation measures are taken, it will still have low negative impacts.

In the operation stage of the project, negative visual impacts should mainly include: newly-built border fence and roads has low negative visual impacts on the staff of Muk Wu pumping station and residents at Nga Yiu Tsuen Hong Kong; newly-built riverbank has low negative visual impacts on the staff of Muk Wu Pumping Station and residents at Nga Yiu Tsuen Hong Kong because of its low visual barrier.

Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage, negative landscape and visual impacts within operation stage is low, negative landscape and visual impacts caused by the project in the area is acceptable after adopting mitigation measures.

10.8.6 *Brief Summary*

(1) Landscape Impact

Construction Stage

In construction stage, construction of the project needs to occupy a large amount of land. This will cause loss of landscape resources, thus have a high negative impact on landscape resources. Besides, all construction equipment, construction site, and temporary construction establishments will cause high-moderate. negative impacts on landscape character, and river channel excavation and lining, embankment and bridge reconstruction will cause the change of local landscape character, leading to an impact on landscape character. Meanwhile, part of the construction occupied land will become bared ground, therefore having a high negative impact on landscape character. But, the lost landscape resources can be compensated after mitigation measures are taken. For example high-moderate, negative impact caused by construction can be mitigated by means of enhancing construction management.

Operation Stage

In operation stage, because of the modifications that the river channel is wider thus water surface is widened, the sediment is cleared, and the newly-built bridges are more beautiful, positive impacts on landscape resources can be expected.

After the project is finished, the followings will have negative impacts on landscape character: the new channel is straighter than before, which will cause low negative impacts on landscape character; the newly-built riverbanks modify local landscape character, which will cause moderate negative impacts on landscape character; artificially concrete or block-stone lined channel replaces the natural one, which will cause moderate-low negative impacts on landscape character. Moreover, on the first day of the operation stage, quality of the compensated landscape resources cannot reach original level, accordingly, the impacts on landscape character will still exist, though the loss of landscape resources caused in construction stage will have been compensated when construction is finished. However, the magnitude is small. After ten years, quality of the compensated landscape resources can reach original level, and then, negative landscape impacts can be negligible.

(2) Visual Impact

Construction Stage

In construction stage, negative visual impacts are mainly visual barrier to VSRs caused by all kinds of construction equipment, construction site and fences, storage, temporary housing and other construction establishments, besides, bridge construction also cause visual barrier to VSRs. The bared construction sites can cause uncomfortable visual feeling to VSRs. But, negative visual impacts can be mitigated after measures are taken. For example, negative visual impacts caused by construction can be mitigated by means of enhancing construction management; compensated landscape resources and restored vegetation on the construction site can help VSRs to regain good visual feeling.

Operation Stage

In operation stage, VSRs can get a good visual feeling because river channel is widened and therefore eyeshot is widened, and sediment in former river channel is removed, which will have positive visual impacts.

Newly-built bridges are basically placed at the site of existing bridges, but are more beautiful than existing bridges, therefore, they cannot form new visual barrier.

The new river course is artificially lined with concrete and block stones, it will give VSRs a visual felling not so good as that of the natural one which is usually covered with green plants. But, after mitigation measures are taken, plants will grow in the new river course, mitigating the negative visual impacts. The newly-built border fence and roads will be closer to VSRs because river channel is widened, their visual

barriers will be a little greater than before, however, the negative impact is low.

To sum up, most negative landscape impacts in operation stage are unavoidable, but insignificant, and no special landscape mitigation measure is necessary. For mitigation of the negative visual impact caused by the new lined river course, grasscrete can be use on the berm.

(3) Conclusion

Negative landscape and visual impacts caused by the project are mainly within construction stage, and accordingly are temporary ones. Furthermore, most impacts can be mitigated to below moderate level after measures are taken.

In operation stage, landscape and visual impacts caused by the project include positive and also negative ones. The positive impacts are mainly in the magnitude of moderate to low. On the first day of the operation stage, negative impacts are mainly in the magnitude of moderate; thereafter, the negative impacts will be mitigated with the virescence such as planting of the tree and grass; but gradually decrease after that time till the tenth year when the negative impacts will be negligible.

The conclusion can be derived from Table 10—3a that the area of the landscape resources affected by the project is 50.612 hm^2, the restored area of the landscape resources is 51.974hm^2. It's obvious that there is no impact on the landscape resource by the project. To sum up, when the project is finished, landscape in the Project Area will not be significantly affected, and the key eyeshots will not be spoiled. Besides, construction of the project will not significantly spoil the aesthetic environment. Moreover, sediment clearing and planting along the riverbanks will help beautifying the local landscape.

The Landscape Master Plan shall be submited to specific government agency for the approval and examination prior to the commencement of the Project.

According to the Annex 10 of *Technical Memorandum on Environmental Impact Assessment Process*, negative landscape and visual impacts caused by the Project are acceptable after mitigation measures are taken.

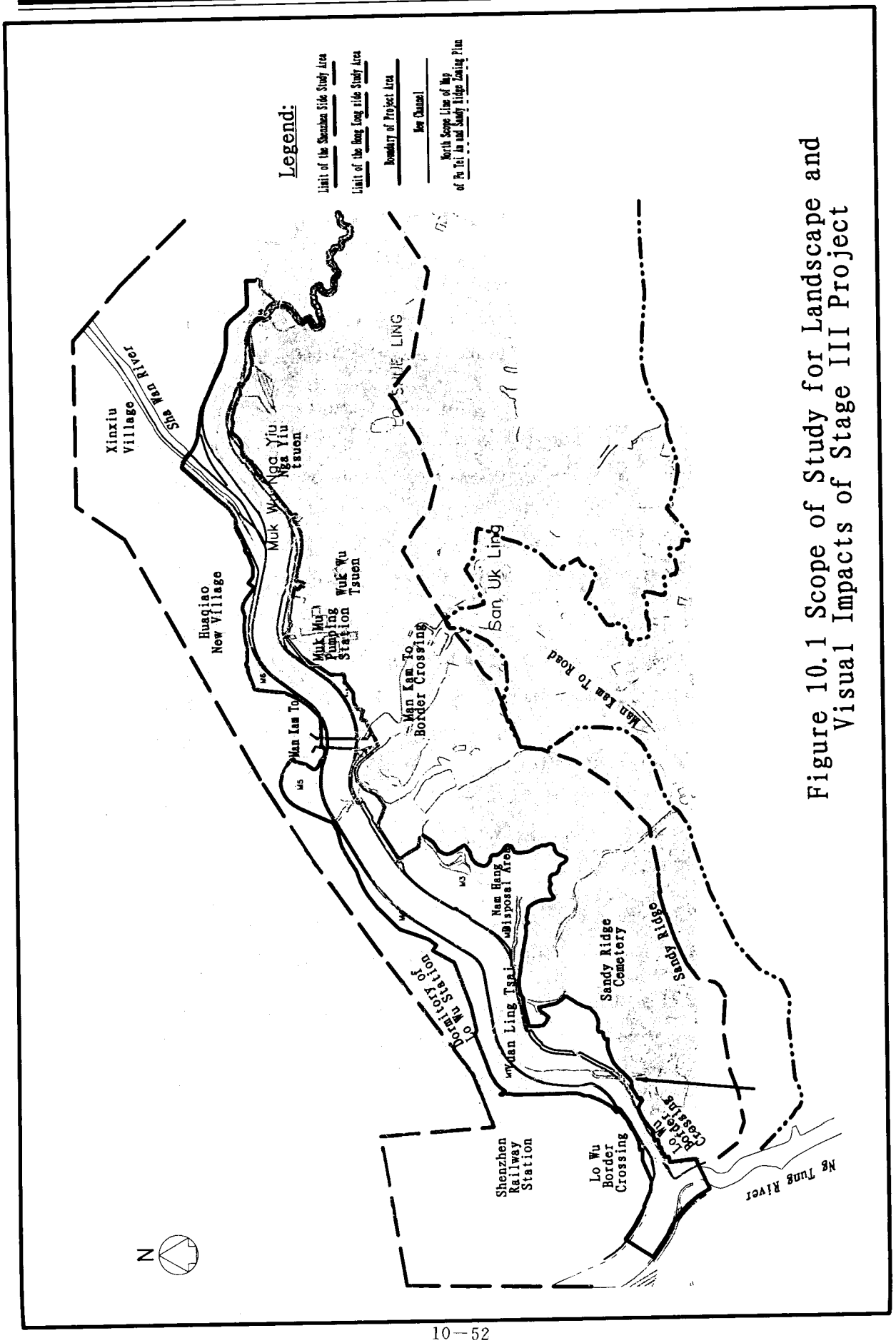


Figure 10.1 Scope of Study for Landscape and Visual Impacts of Stage III Project

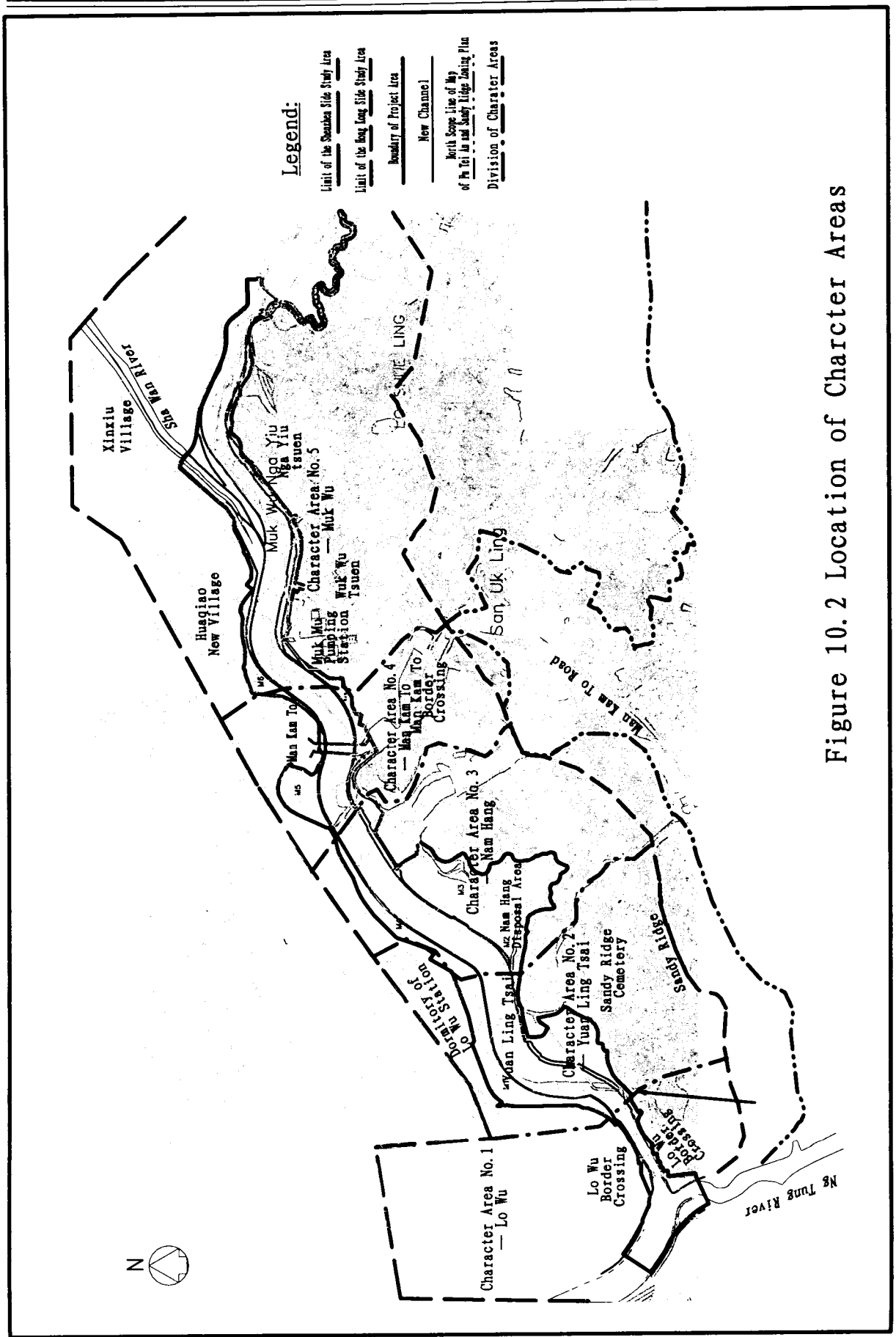


Figure 10.2 Location of Charcter Areas

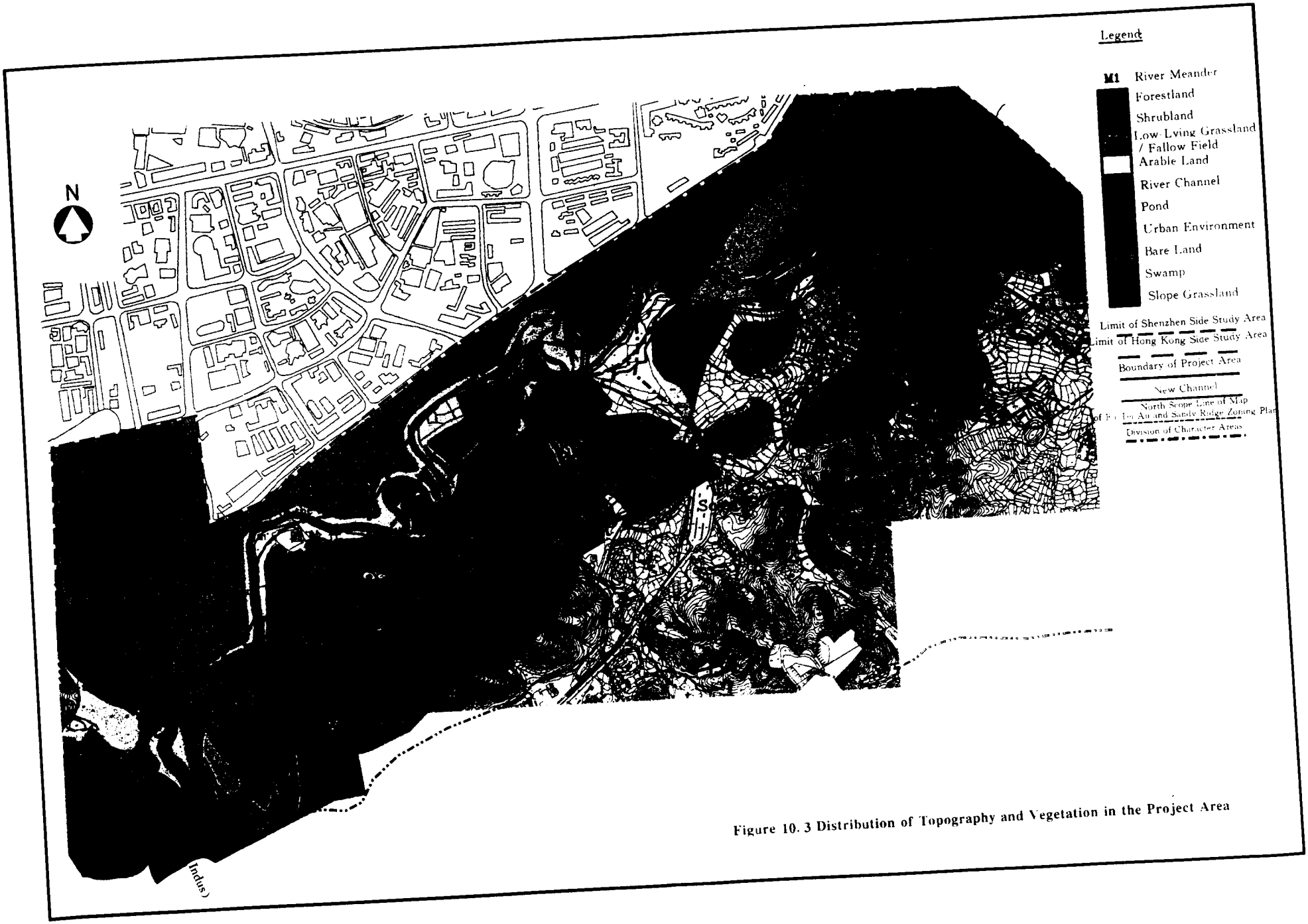


Figure 10. 3 Distribution of Topography and Vegetation in the Project Area

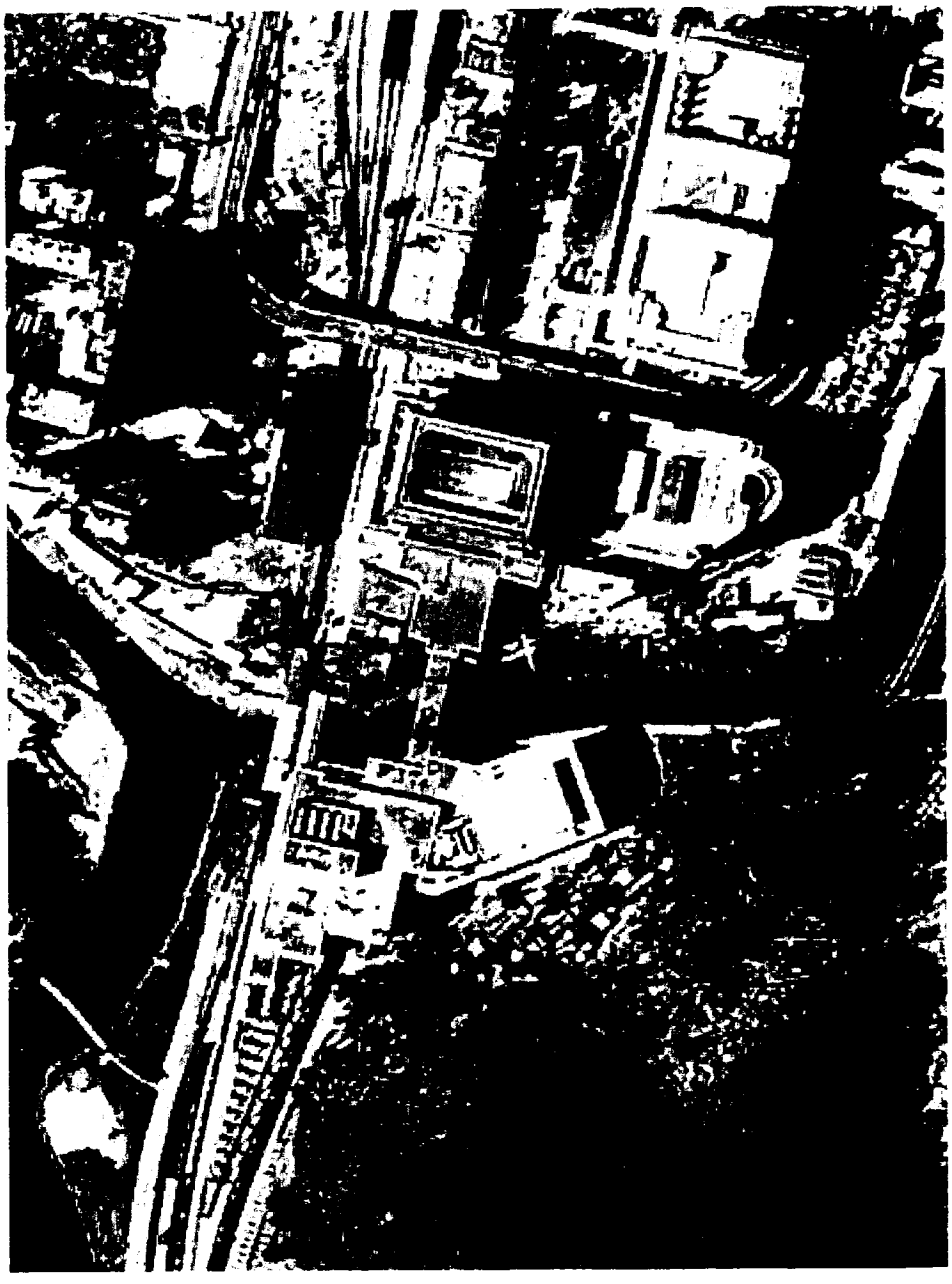


Figure 10. 4 Character Area No. 1 - Lo Wu

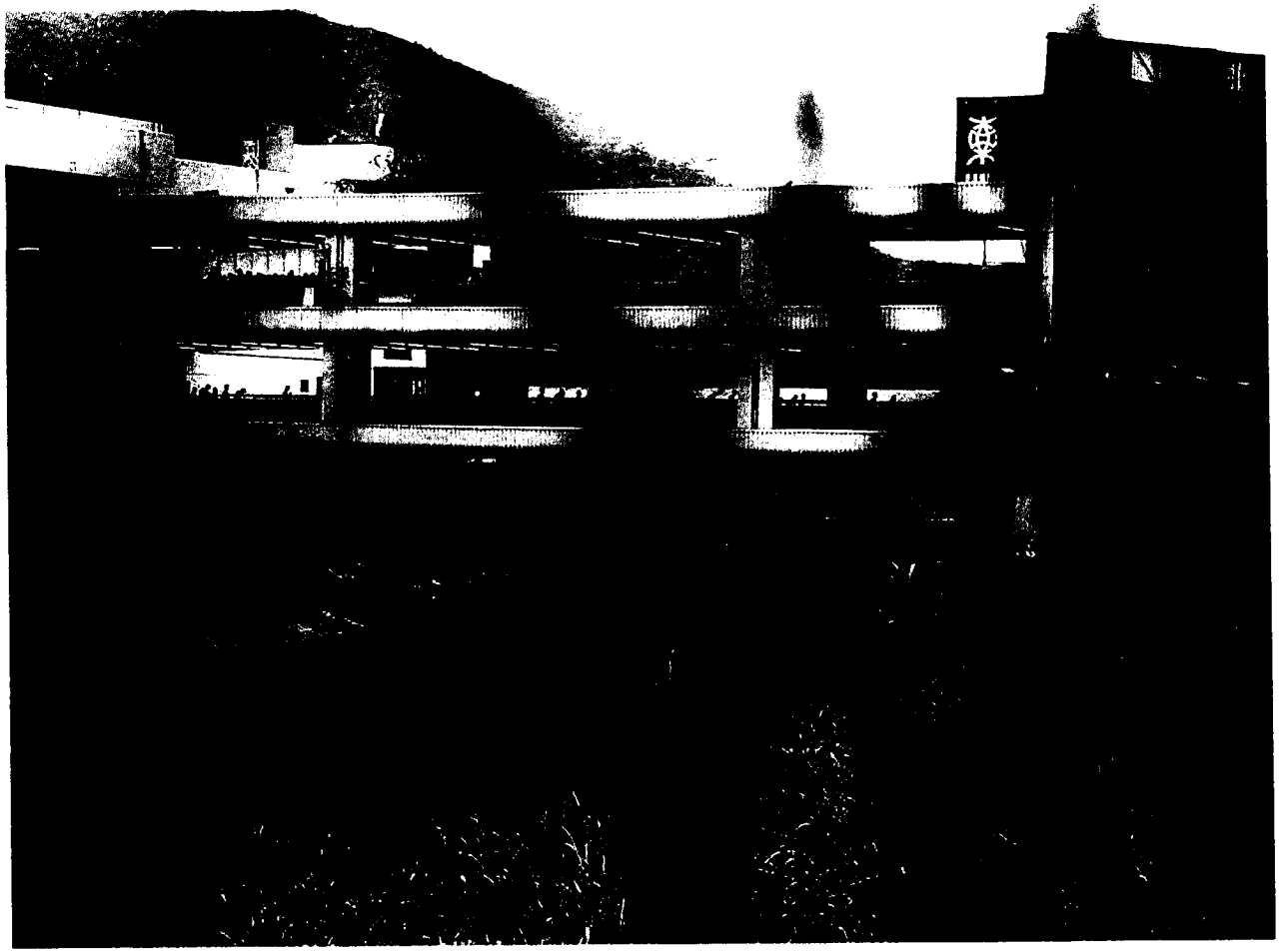


Figure 10. 5 Character Area No. 1 - Existing Lo Wu New Footbridge

Figure 10. 6 Character Area No. 1 - Existing Lo Wu Old Footbridge

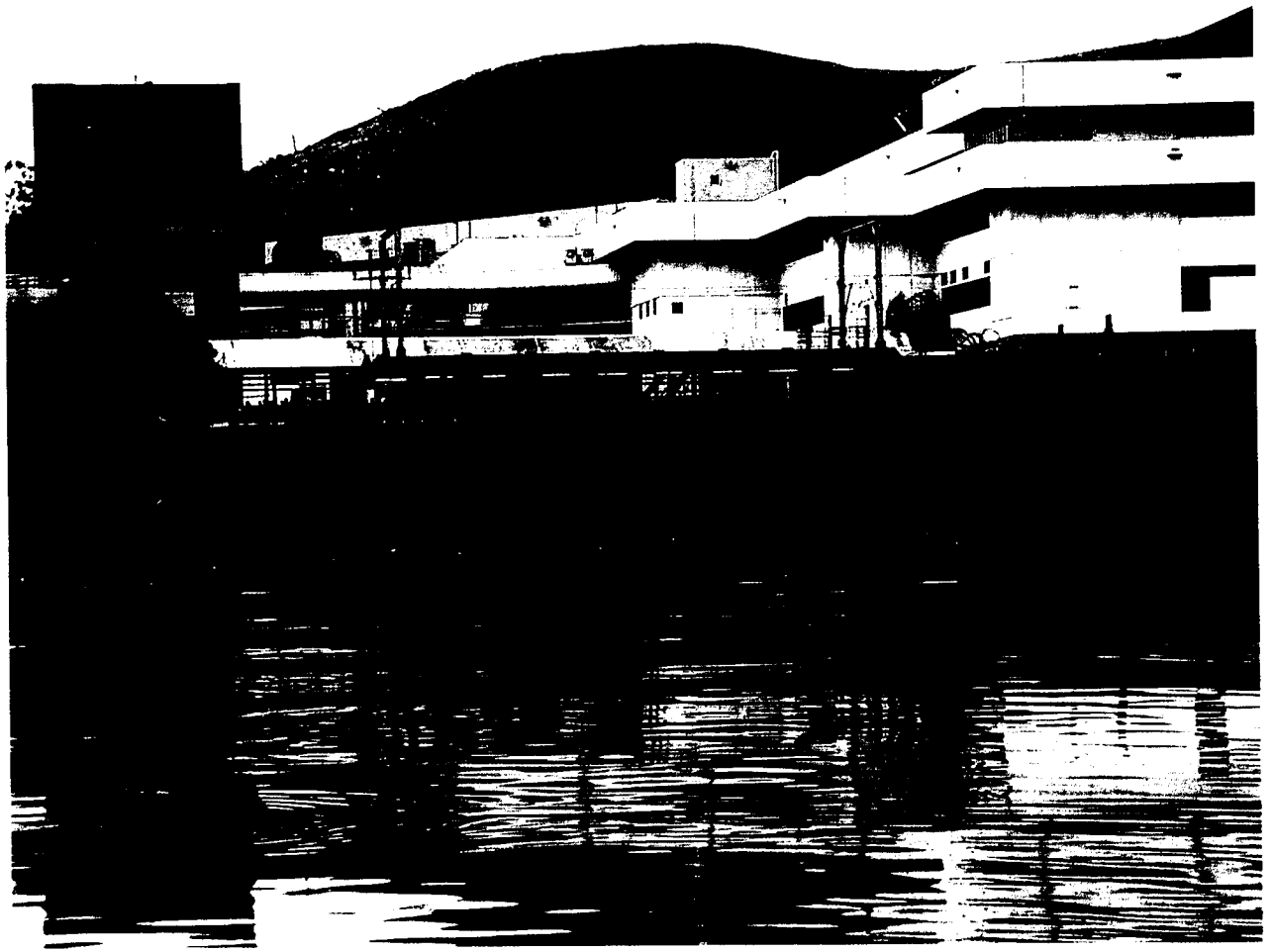


Figure 10. 7 Character Area No. 1 - Existing Lo Wu Railway Bridge

Figure 10. 8 Character Area No. 2 - Yuan Ling Tsai

Figure 10. 9 Character Area No. 3 - Nam Hang

Figure10 9a Nam Hang Spoil Ground

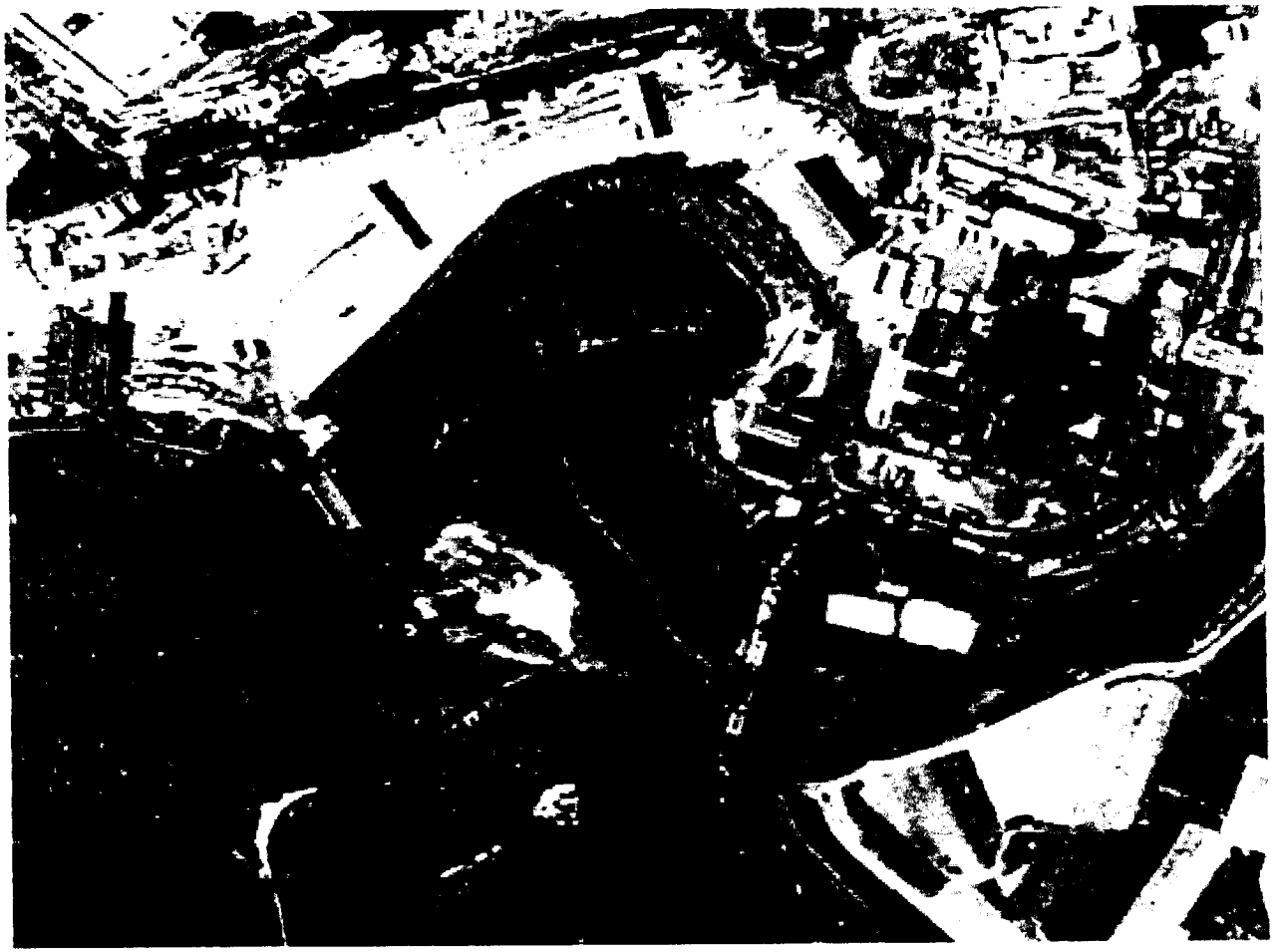


Figure 10. 10 Character Area No. 4 - Man Kam To

Figure 10. 11 Character Area No. 4 - Existing Man Kam To Old Bridge

Figure10－11a　River Reaches near Man Kam To Bridge（Upstream）

Figure10 11b River Reaches near Man Kam To Bridge (Downstream)

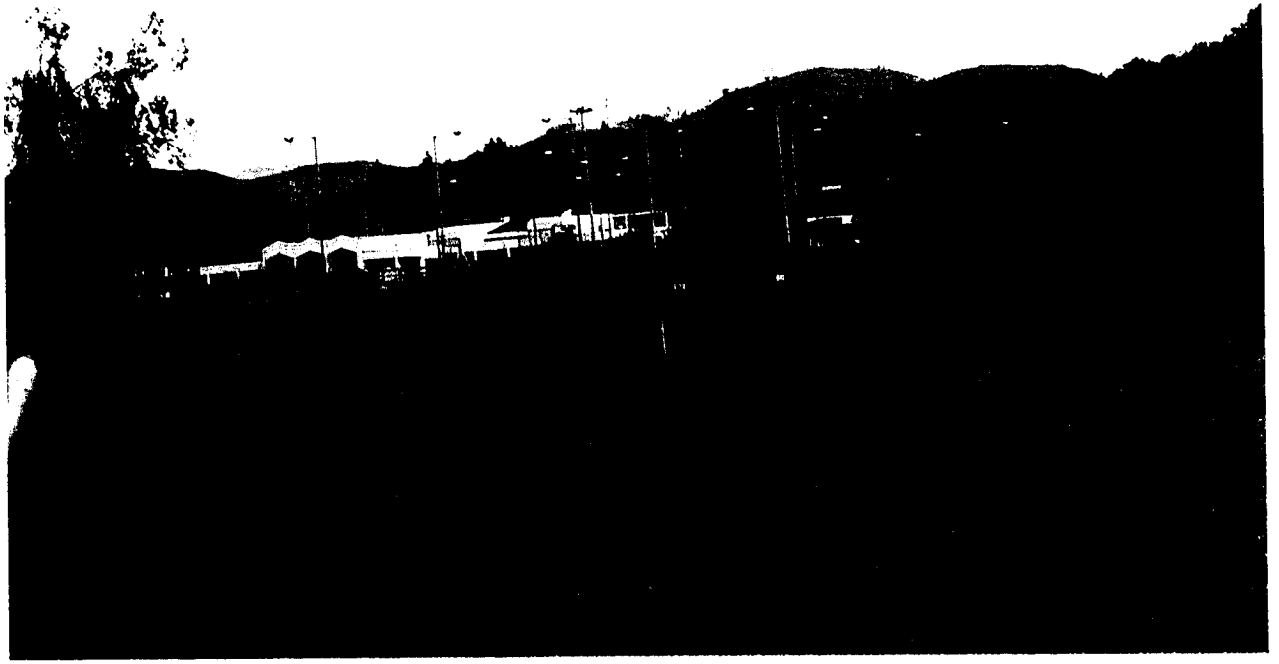


Figure 10. 12 Character Area No. 4 - Existing Man Kam To New Bridge

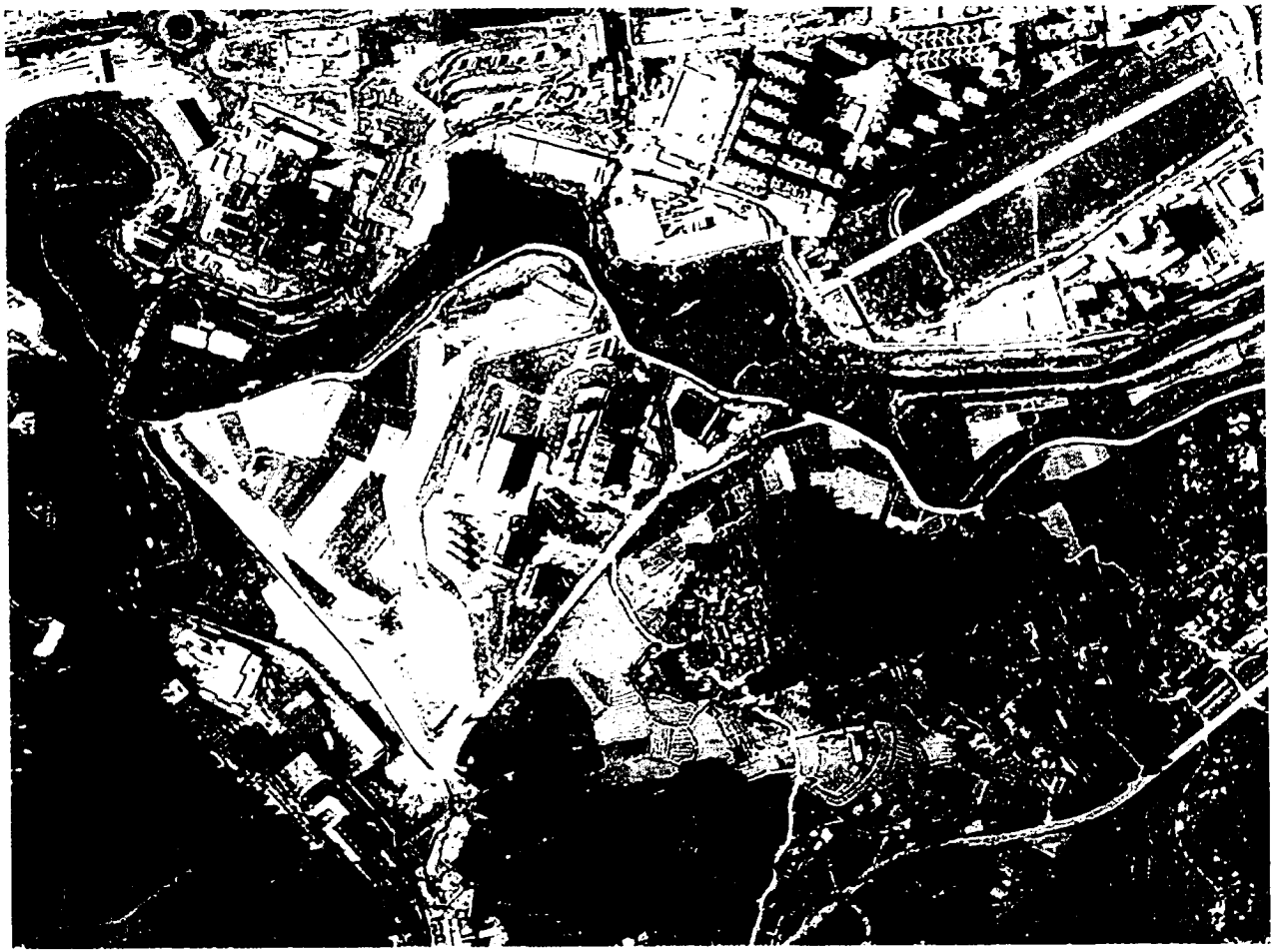


Figure 10. 13 Character Area No. 5 - Muk Wu

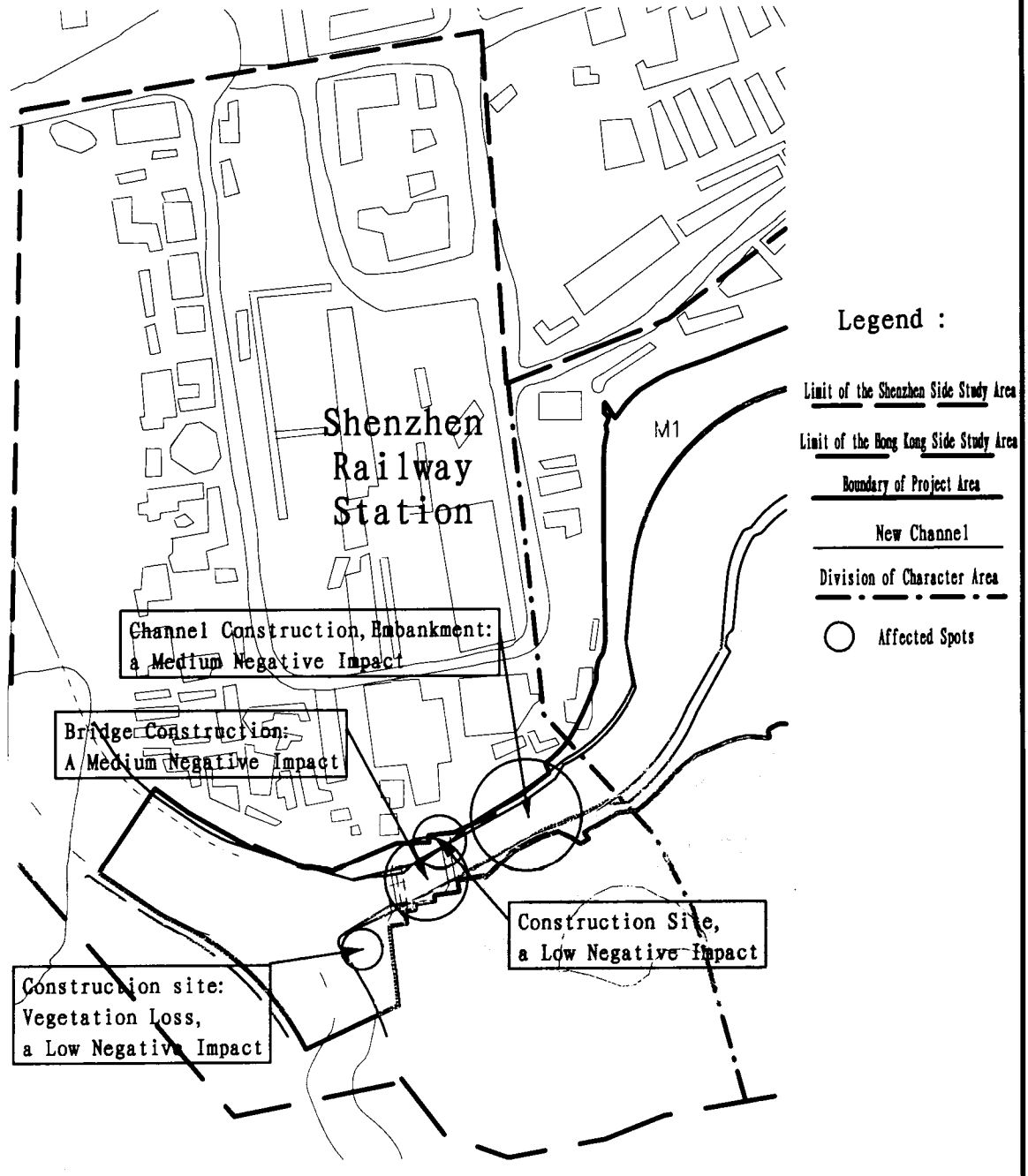


Figure 10.14 Landscape Impact on Charater Area No.1 During Construction Period

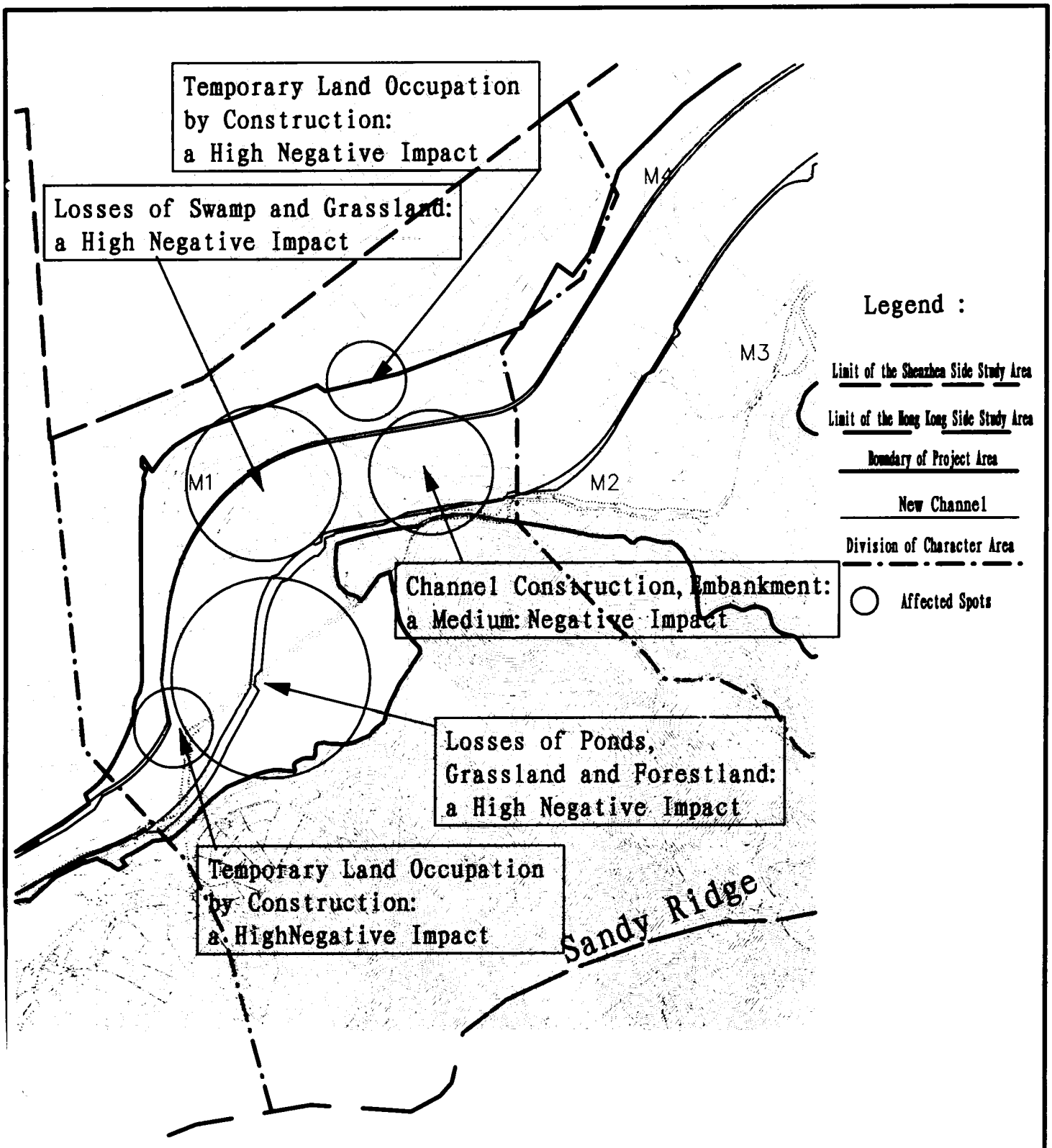


Figure 10.15 Landscape Impact on Character Area No. 2 During Construction Period

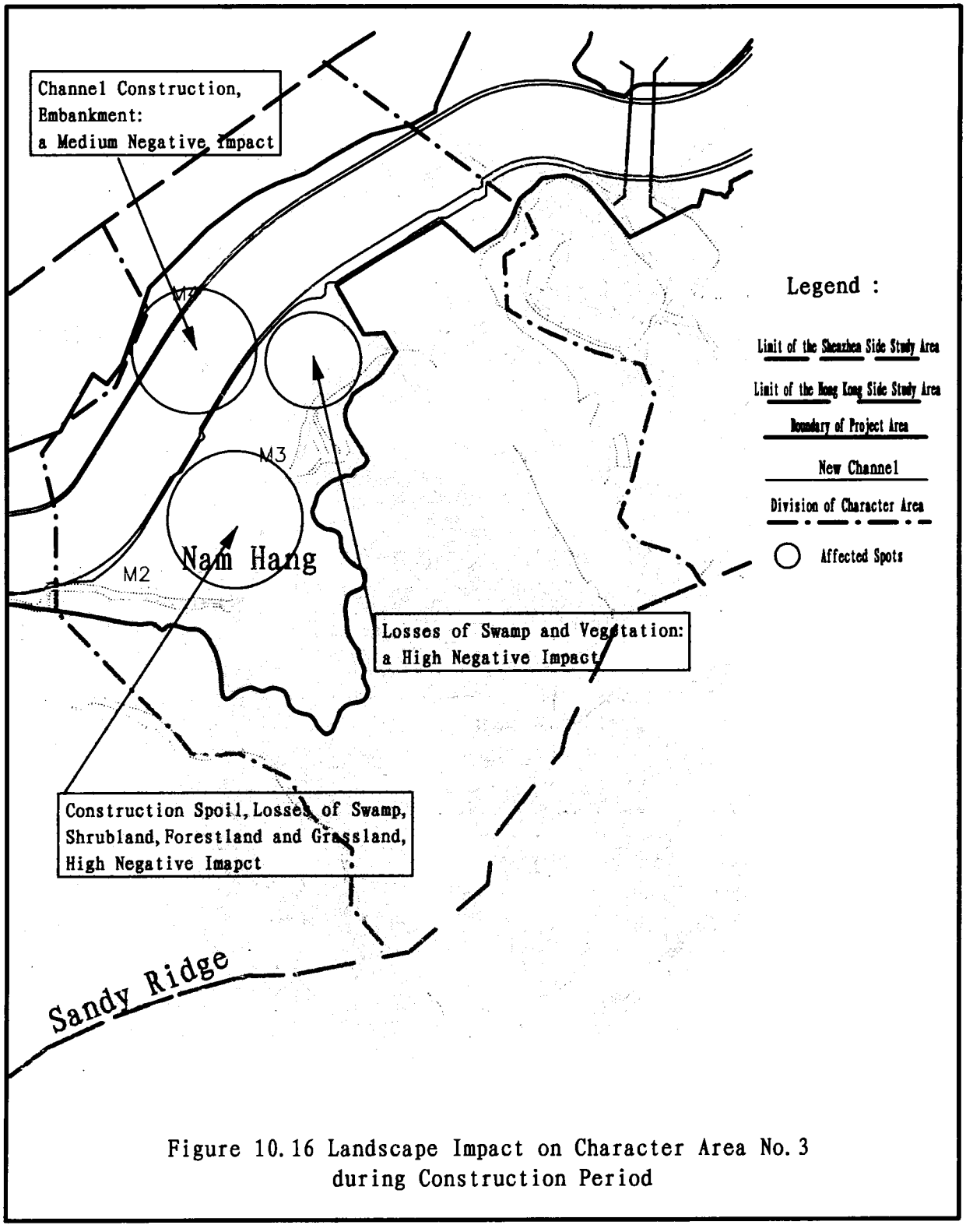


Figure 10.16 Landscape Impact on Character Area No. 3 during Construction Period

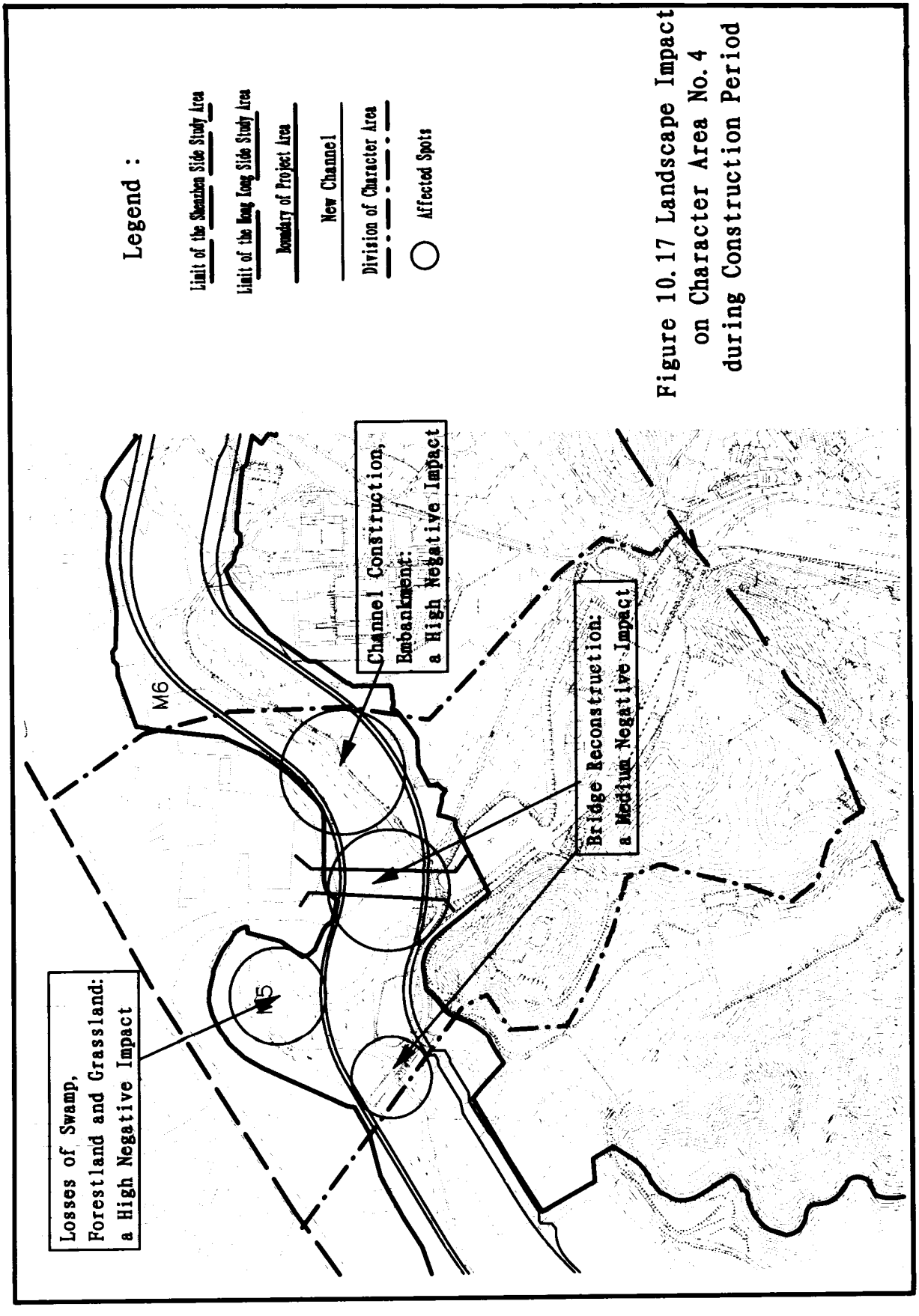


Figure 10.17 Landscape Impact on Character Area No.4 during Construction Period

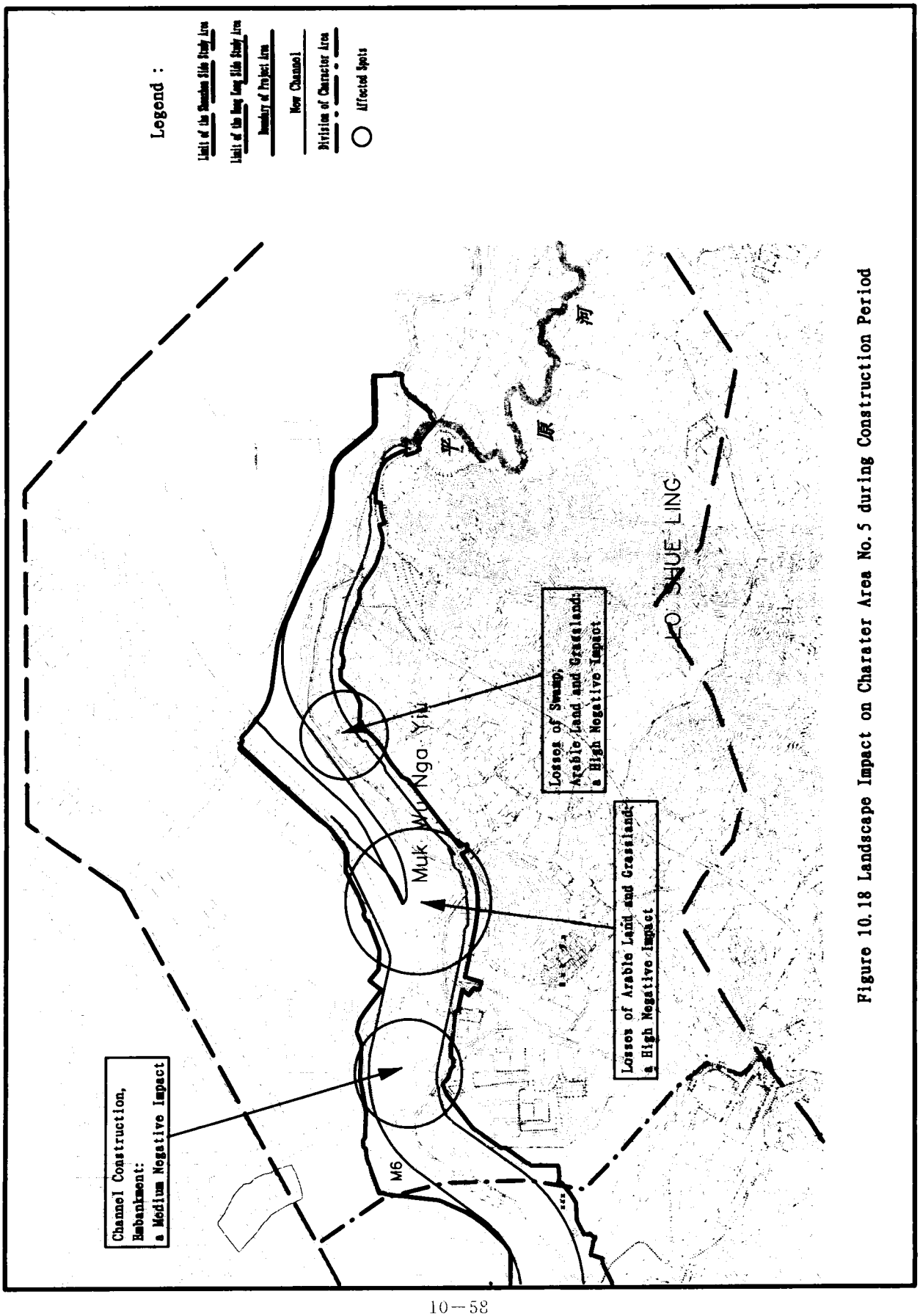


Figure 10.18 Landscape Impact on Charater Area No. 5 during Construction Period

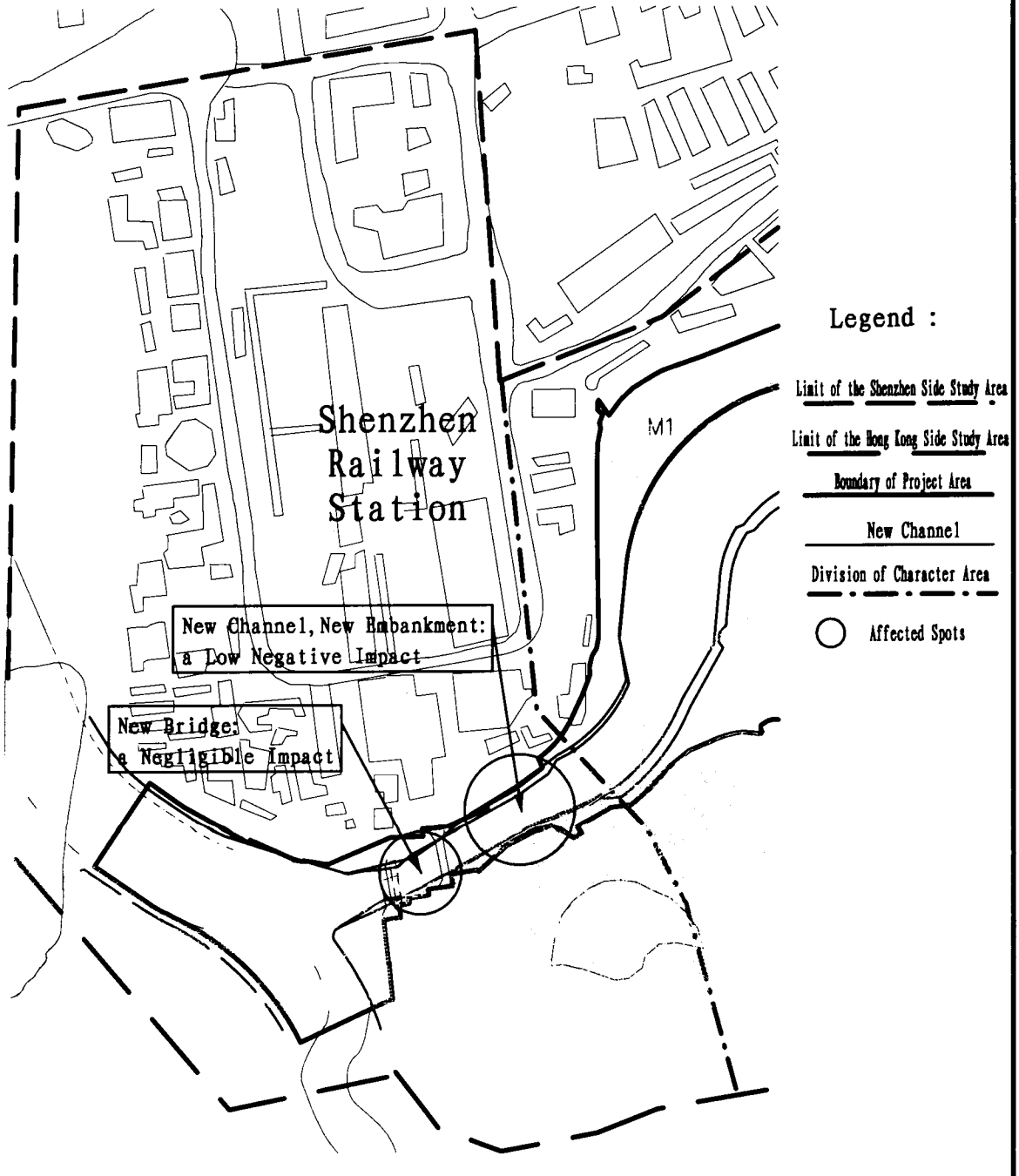


Figure 10.19 Landscape Impact on Charater Area No.1 during Operation Period

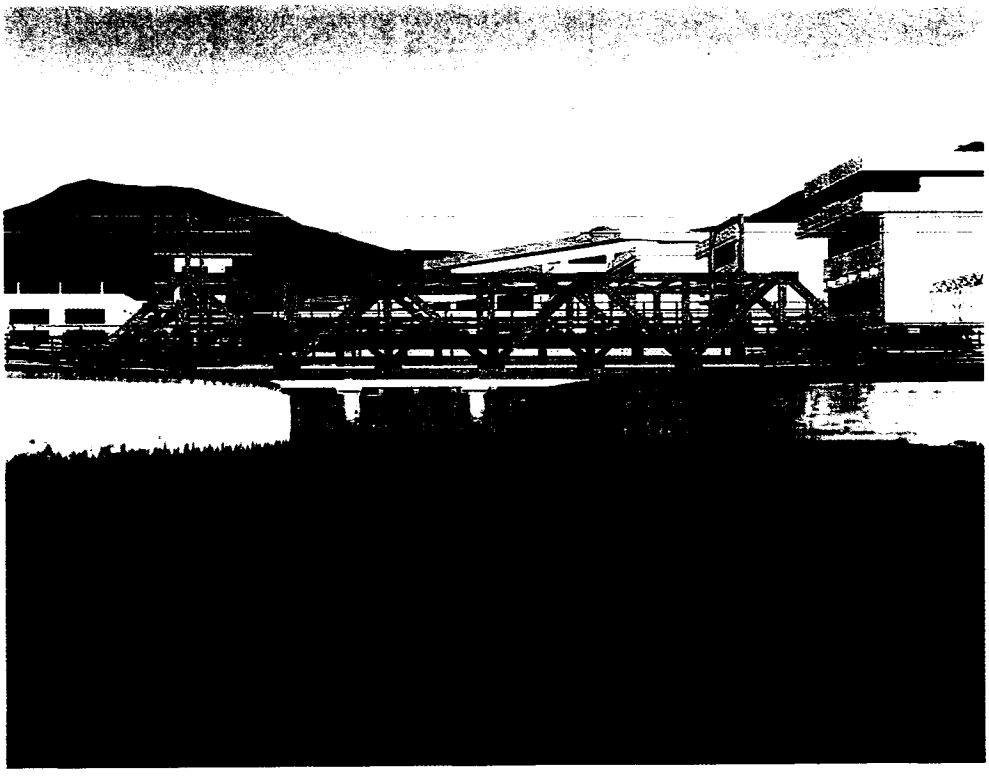


Figure 10. 20 Lo Wu Railway Bridge after Reconstruction

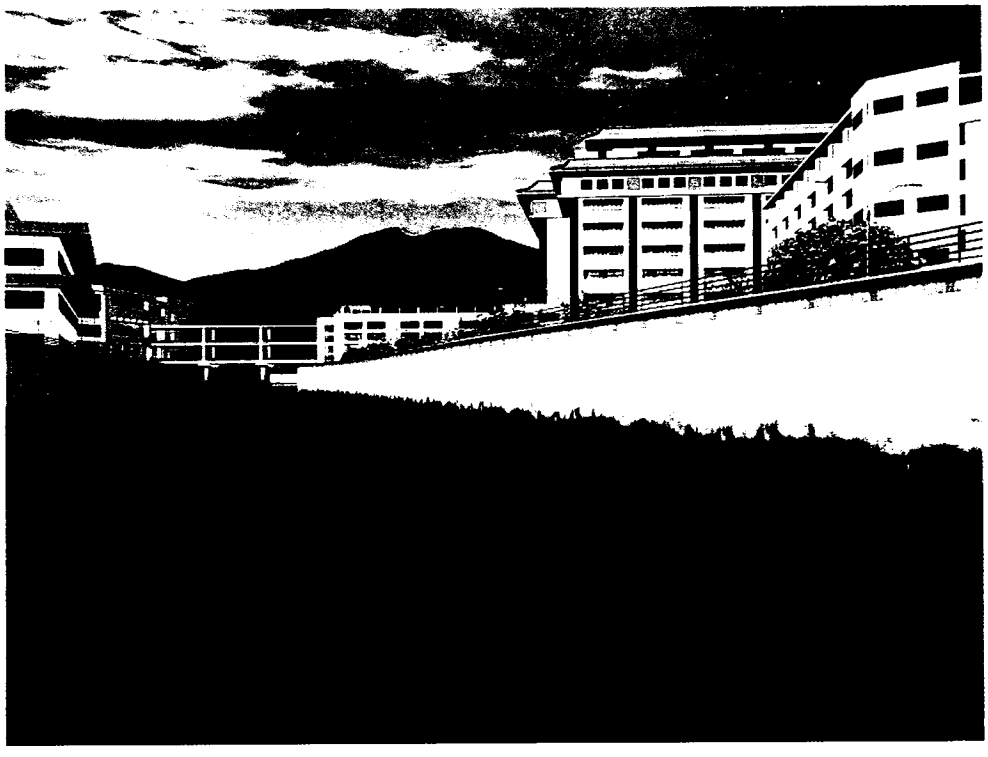


Figure 10. 21 Newly-built Lo Wu Footbridge

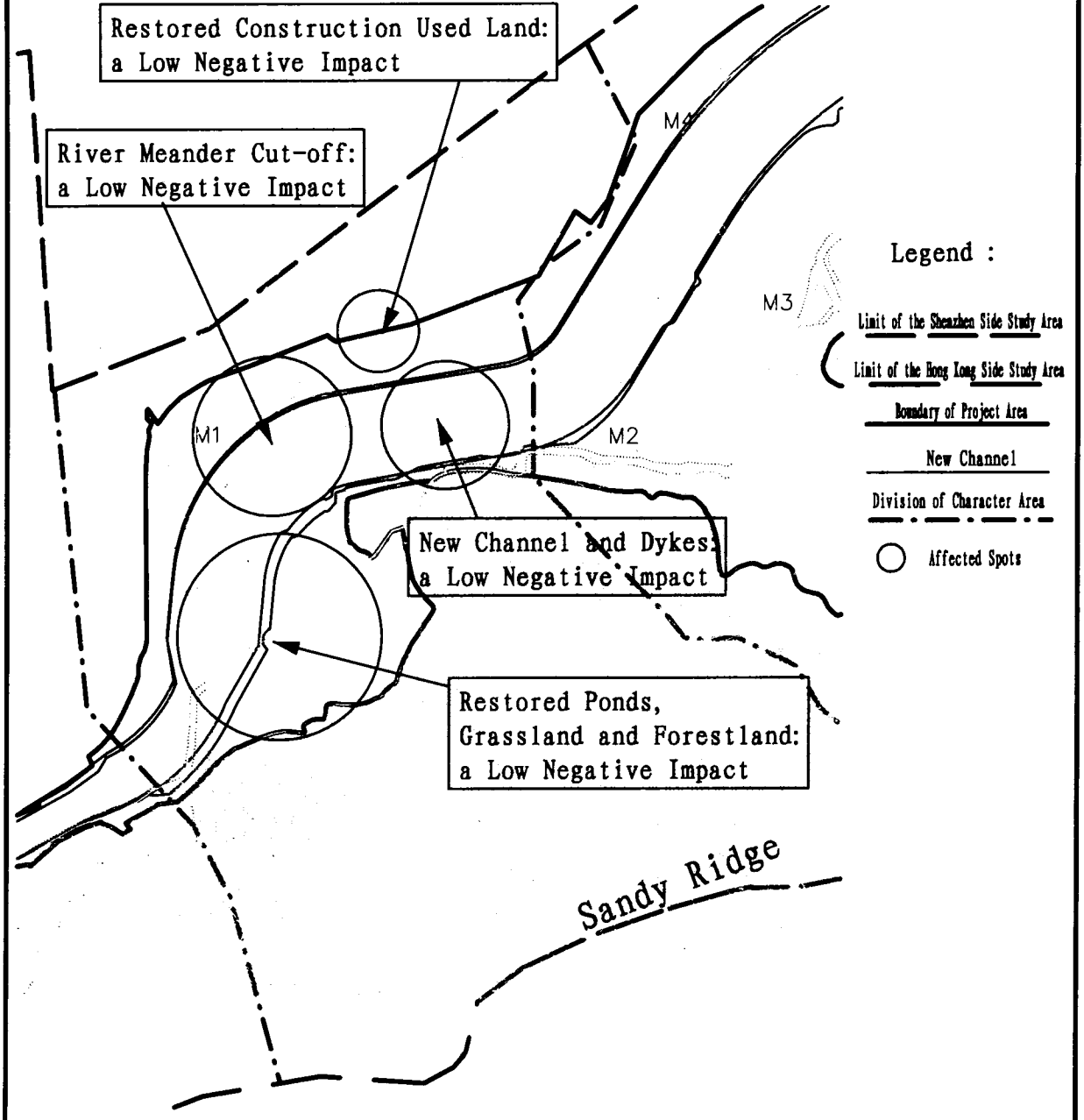


Figure 10.22 Landscape Impact on Character Area No. 2 during Operation Period

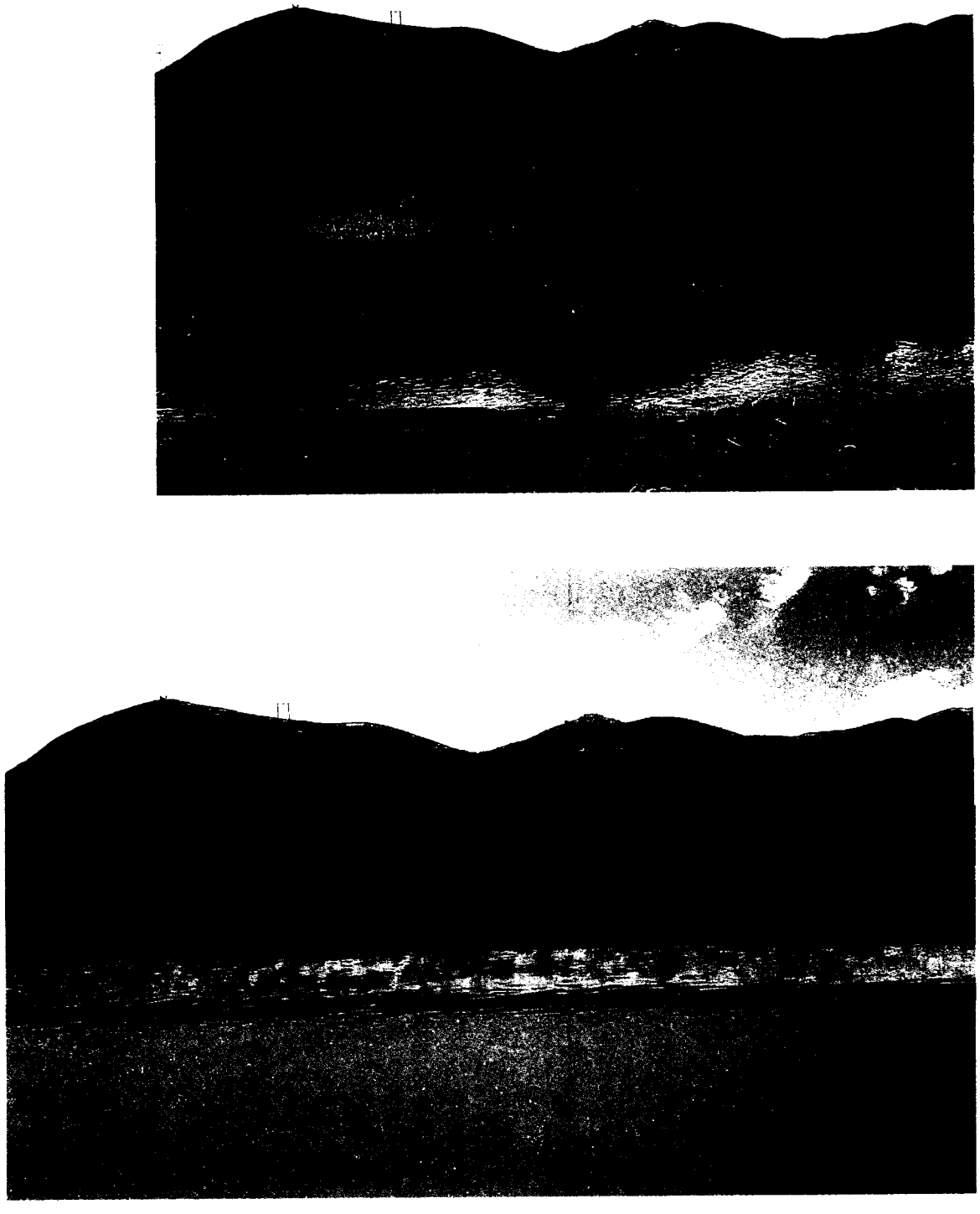


Figure 10. 23 Water Course Landscape before and after Project

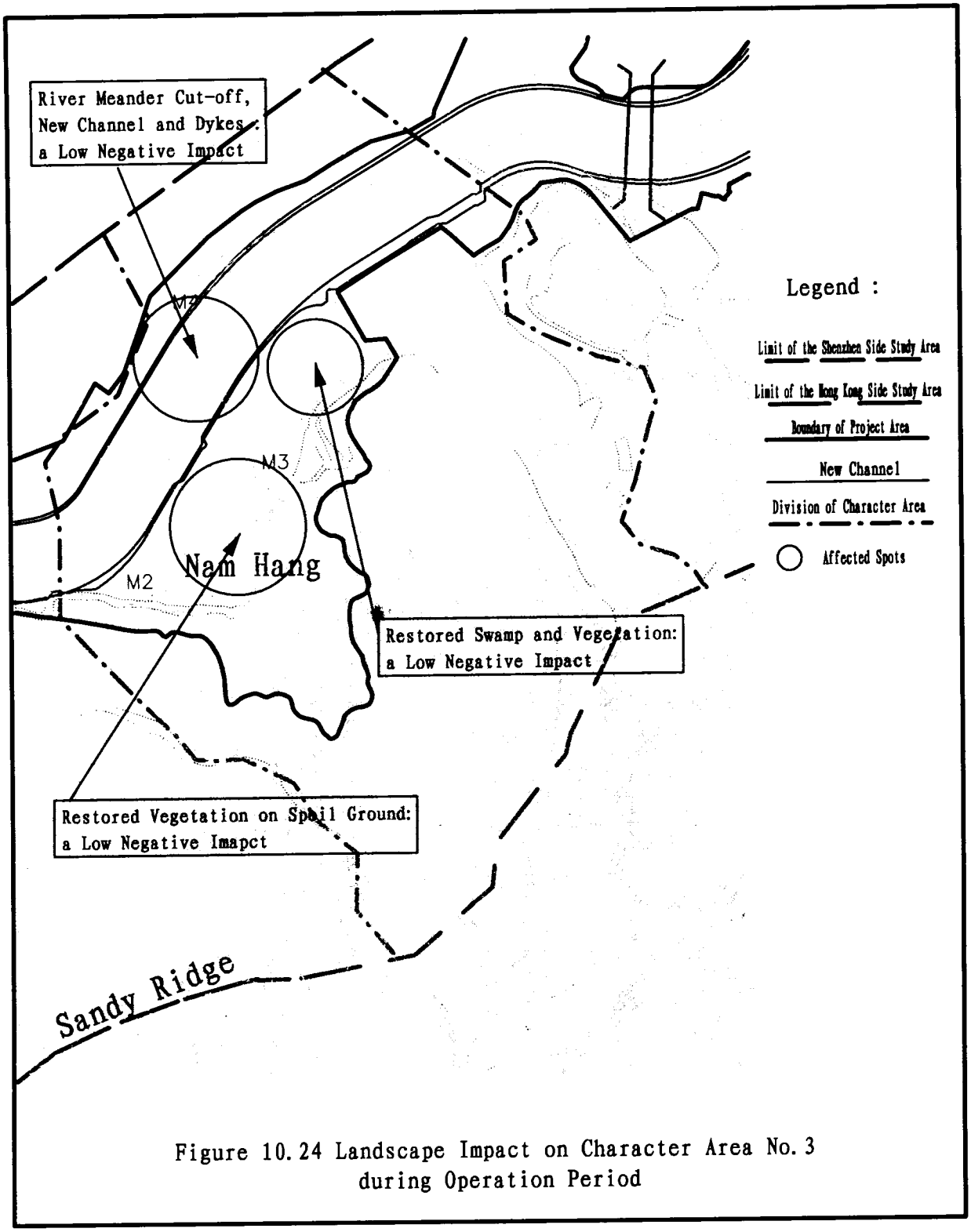


Figure 10.24 Landscape Impact on Character Area No. 3 during Operation Period

Figure 10.25 Landscape Impact on Character Area No.4 during Operation Period

Figure 10. 26 Newly-built Man Kam To Both-way Vehicular Bridge

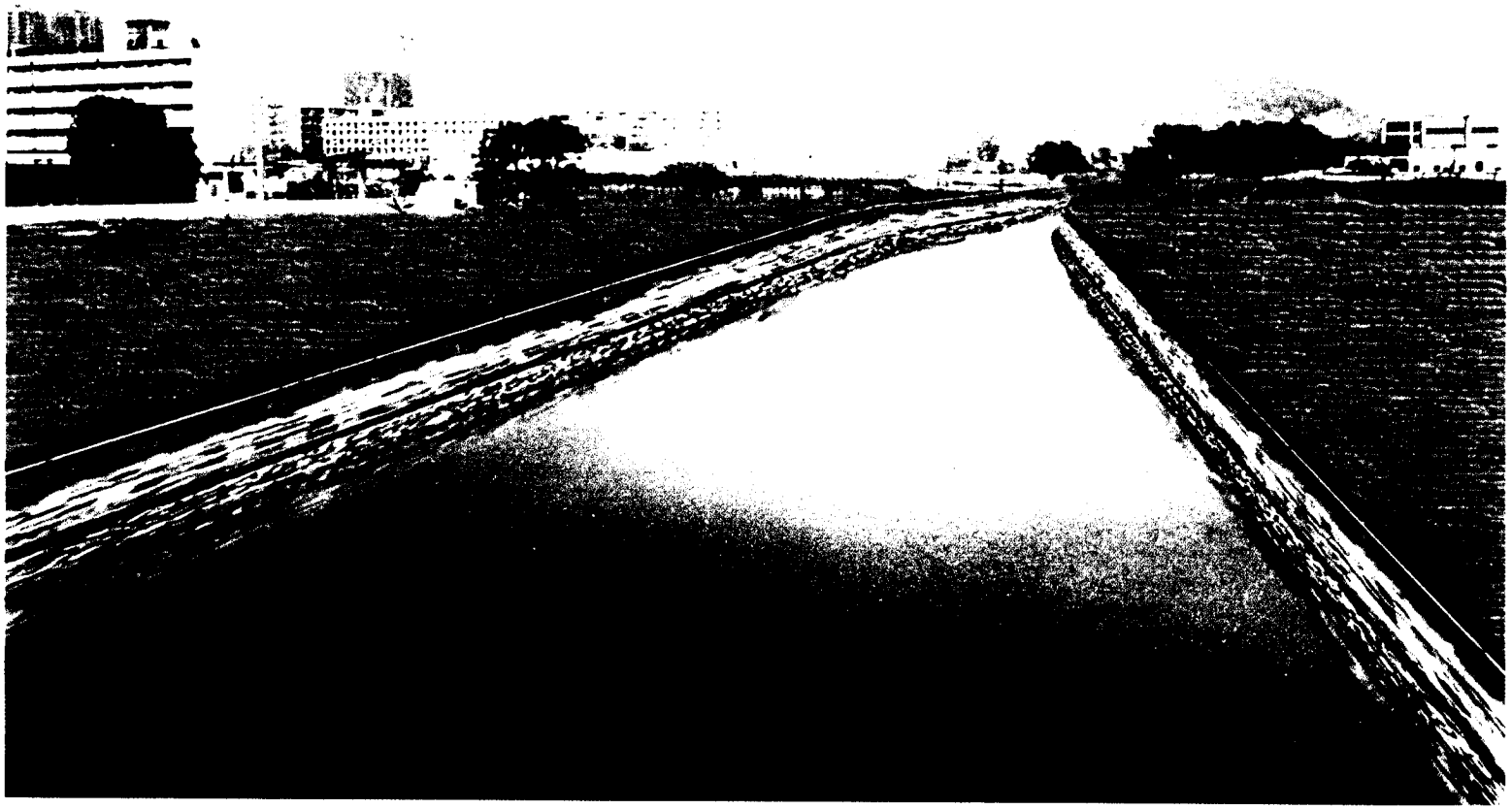


Figure10 26a River Reaches near Man Kam To Bridge on the First Day of Operation (Upstream)

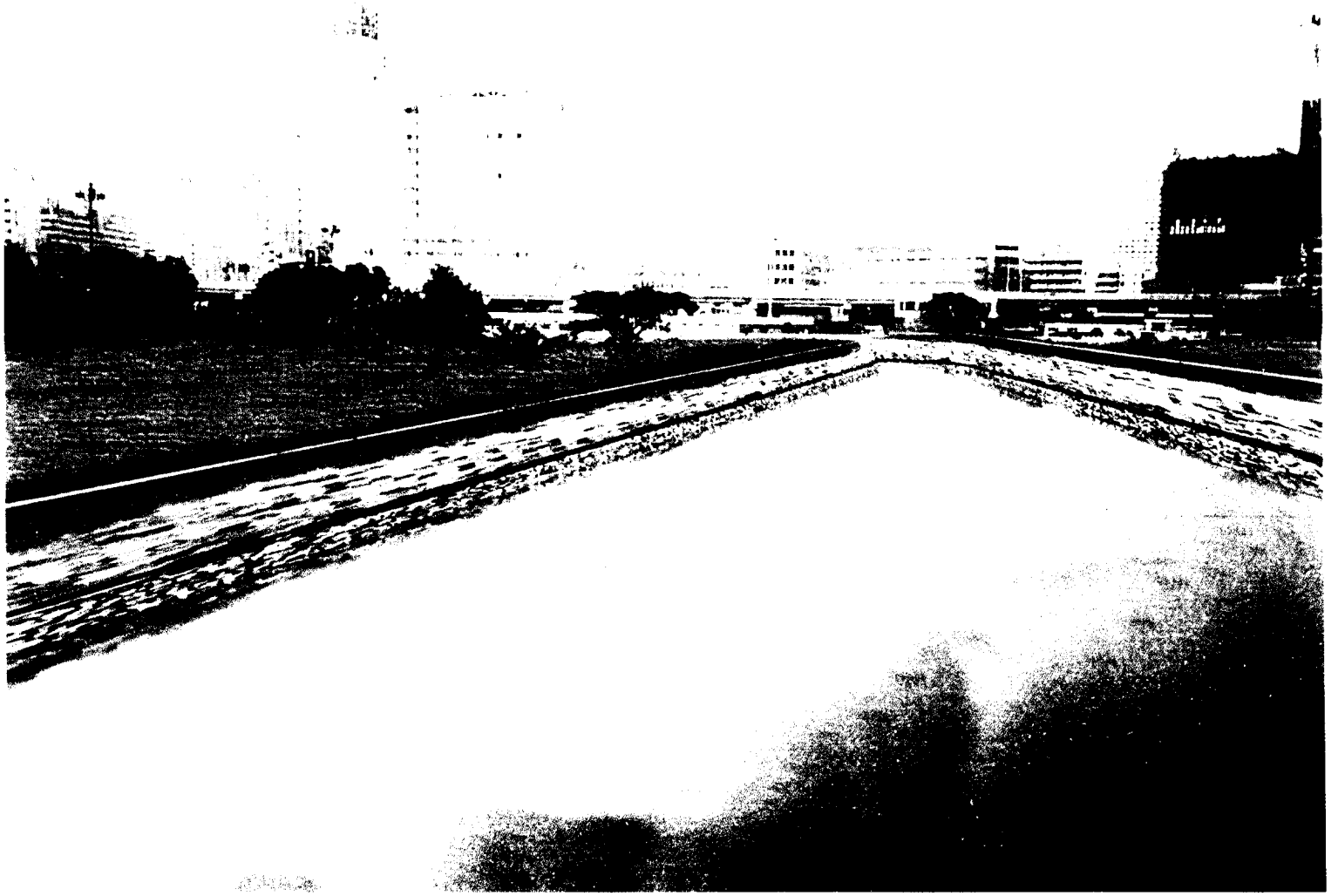


Figure10 26b River Reaches near Man Kam To Bridge on the First Day of Operation (Downstream)

Figure10 26c River Reaches near Man Kam To Bridge in the Tenth Year of Operation (Upstream)

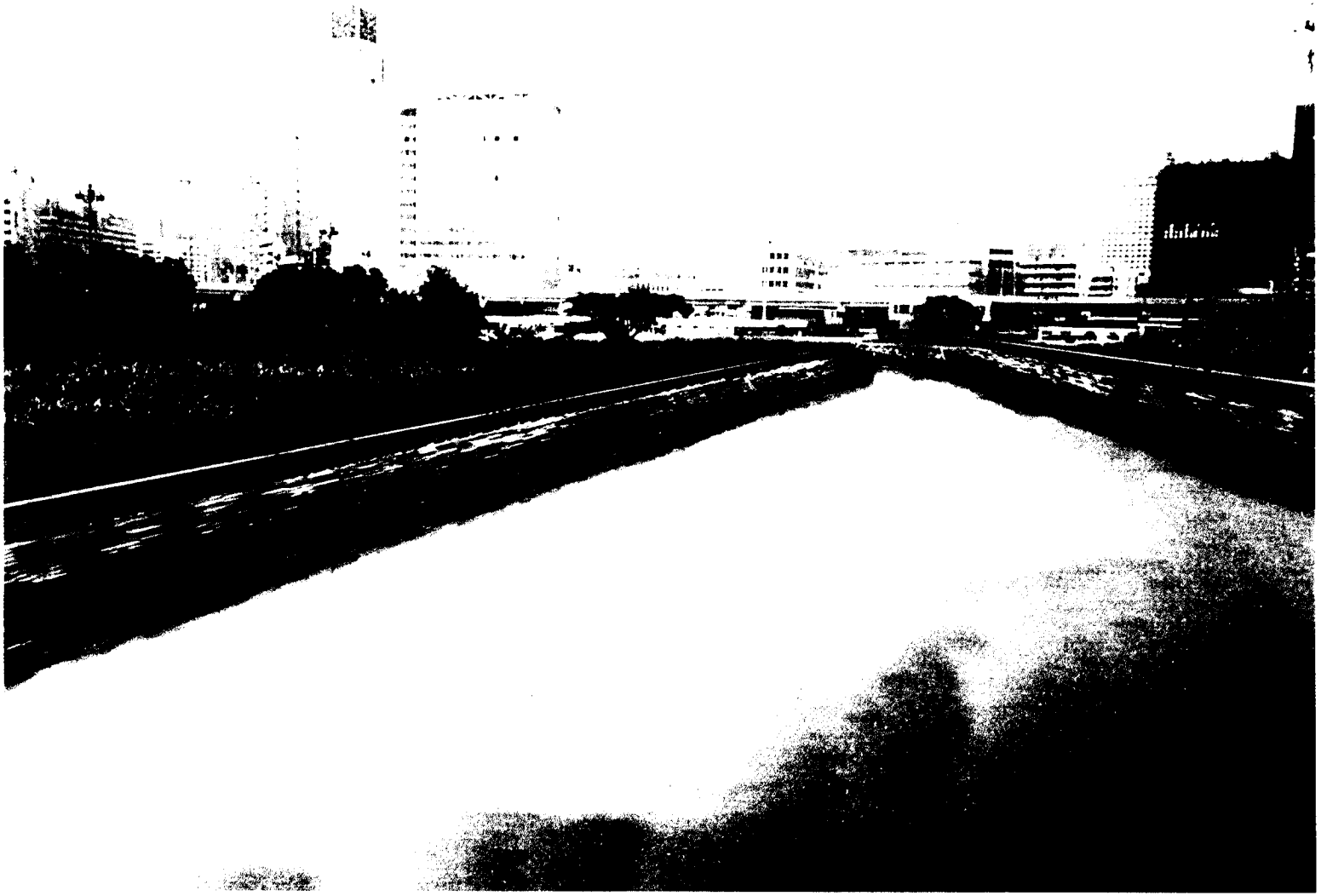


Figure10—26d River Reaches near Man Kam To Bridge in the Tenth Year of Operation (Downstream)

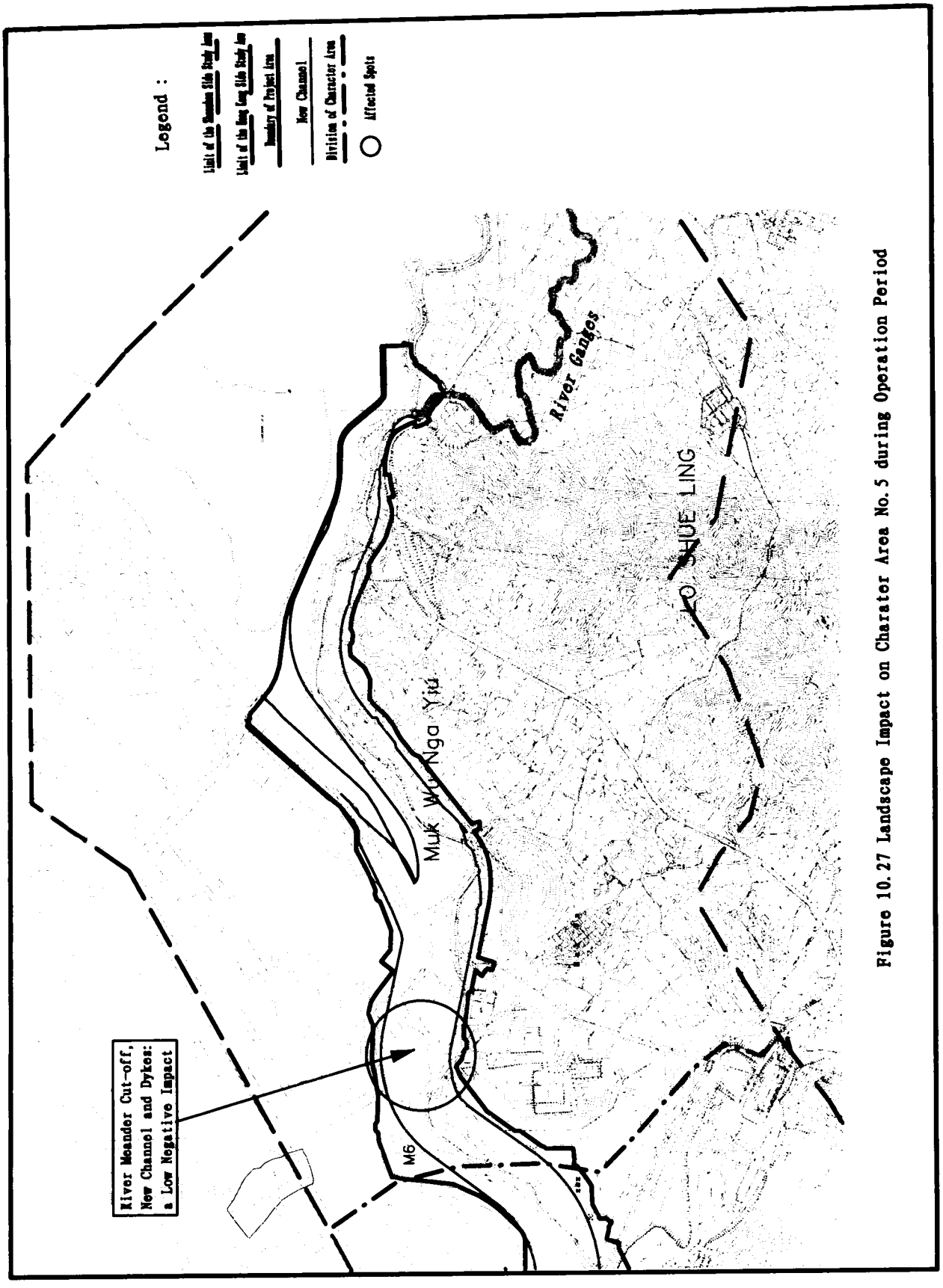


Figure 10.27 Landscape Impact on Charater Area No.5 during Operation Period

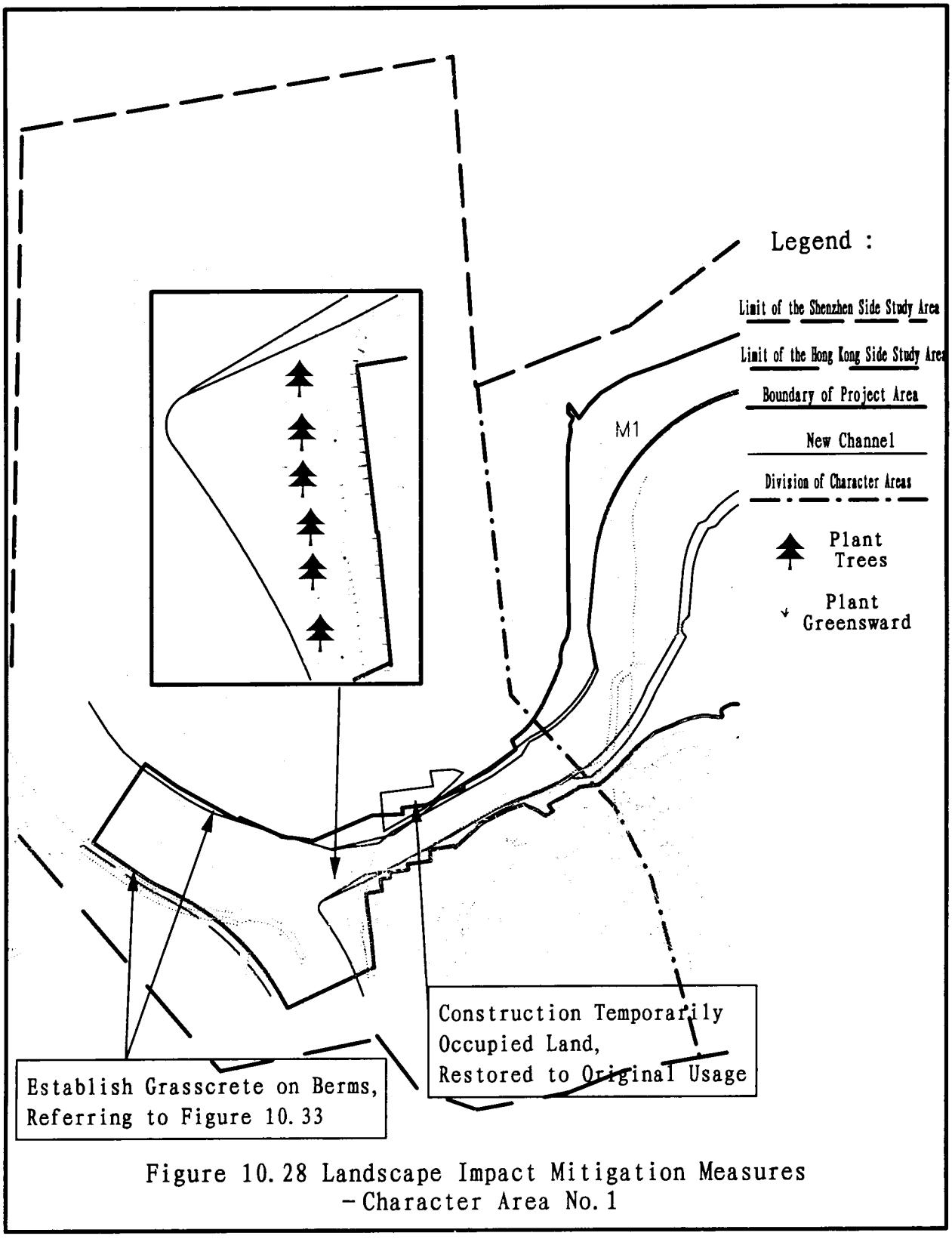


Figure 10.28 Landscape Impact Mitigation Measures
-Character Area No.1

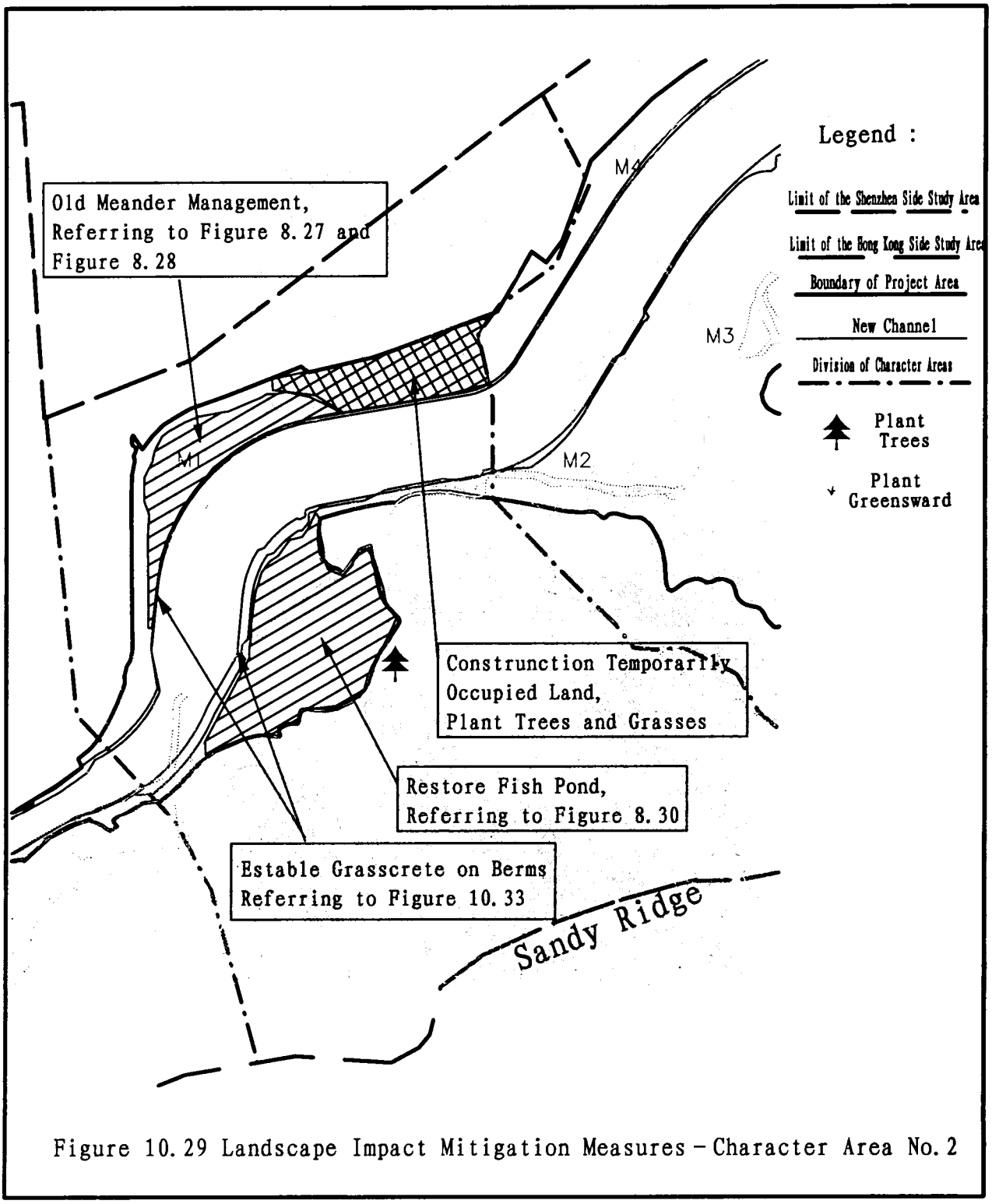


Figure 10.29 Landscape Impact Mitigation Measures - Character Area No. 2

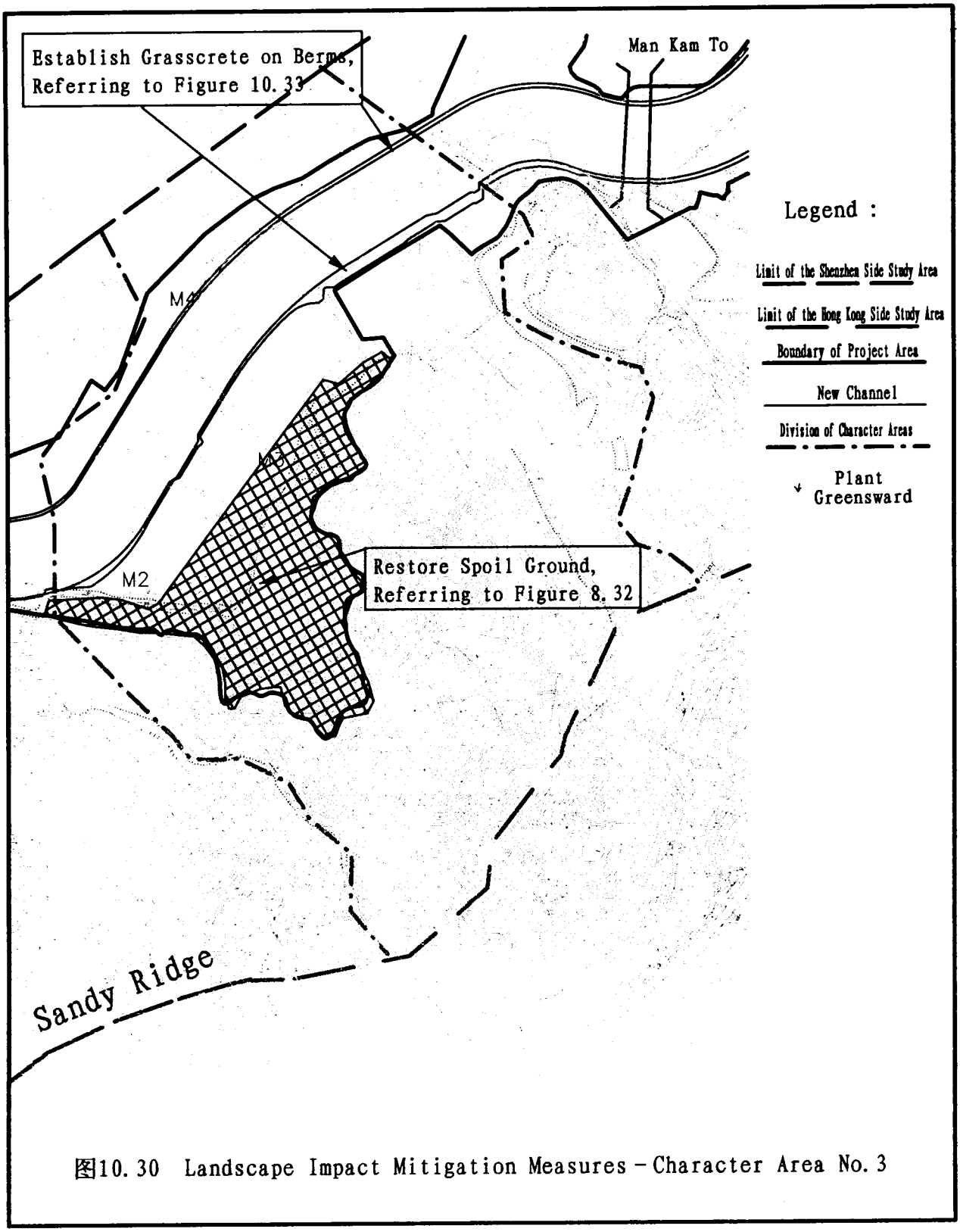
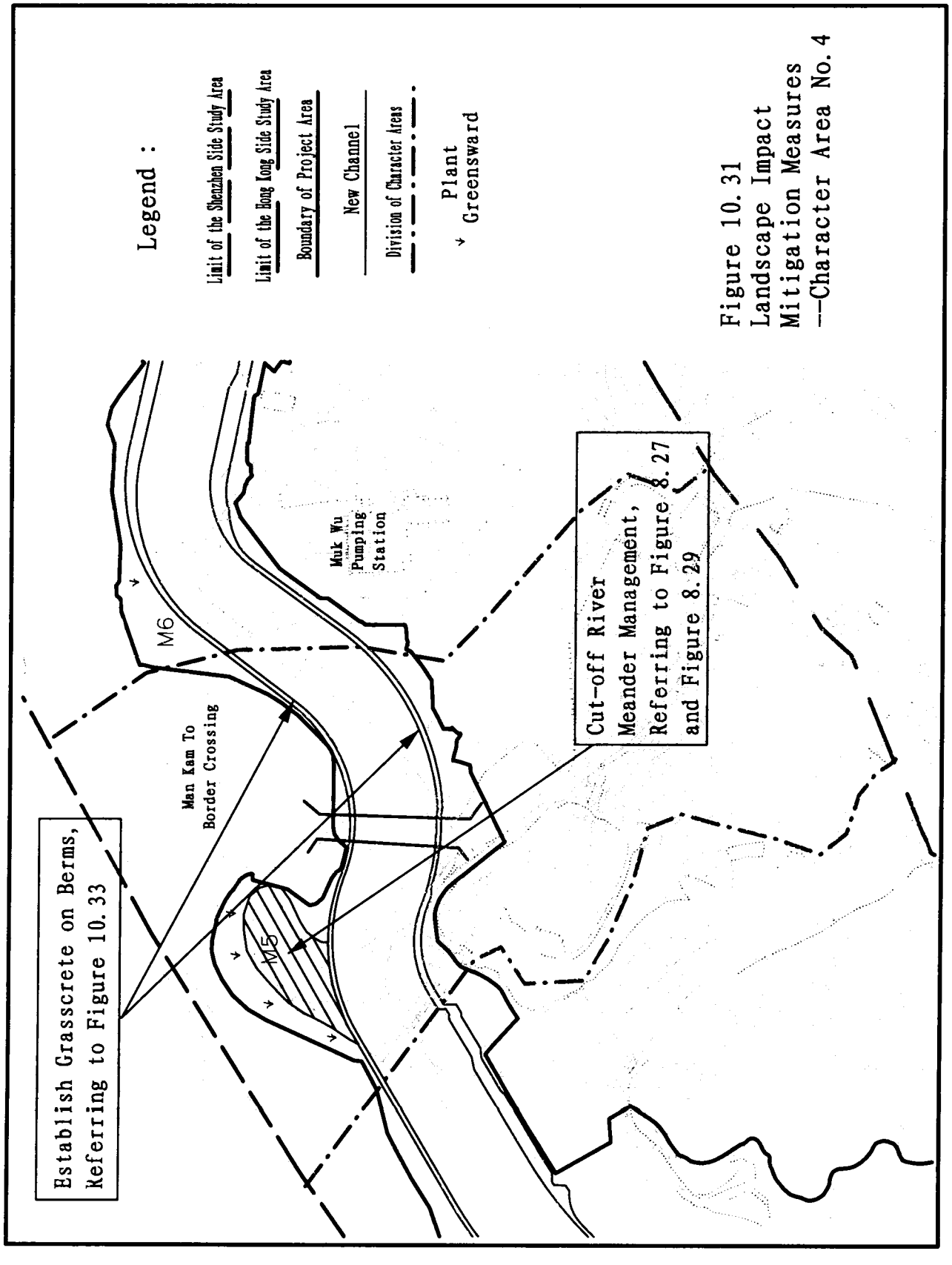


图10.30 Landscape Impact Mitigation Measures - Character Area No. 3

Figure10 30a Nam Hang Spoil Ground on the Fitst Day of Operation

Figure10 30b Nam Hang Spoil Ground in the Tenth Year of Operation


Legend :
Limit of the Shenzhen Side Study Area
Limit of the Hong Kong Side Study Area
Boundary of Project Area
New Channel
Division of Character Areas
Plant
Greensward
Figure 10.31
Landscape Impact
Mitigation Measures
--Character Area No.4
Establish Grasscrete on Berms, Referring to Figure 10.33
Man Kam To Border Crossing
M6
M5
Muk Wu Pumping Station
Cut-off River Meander Management, Referring to Figure 8.27 and Figure 8.29

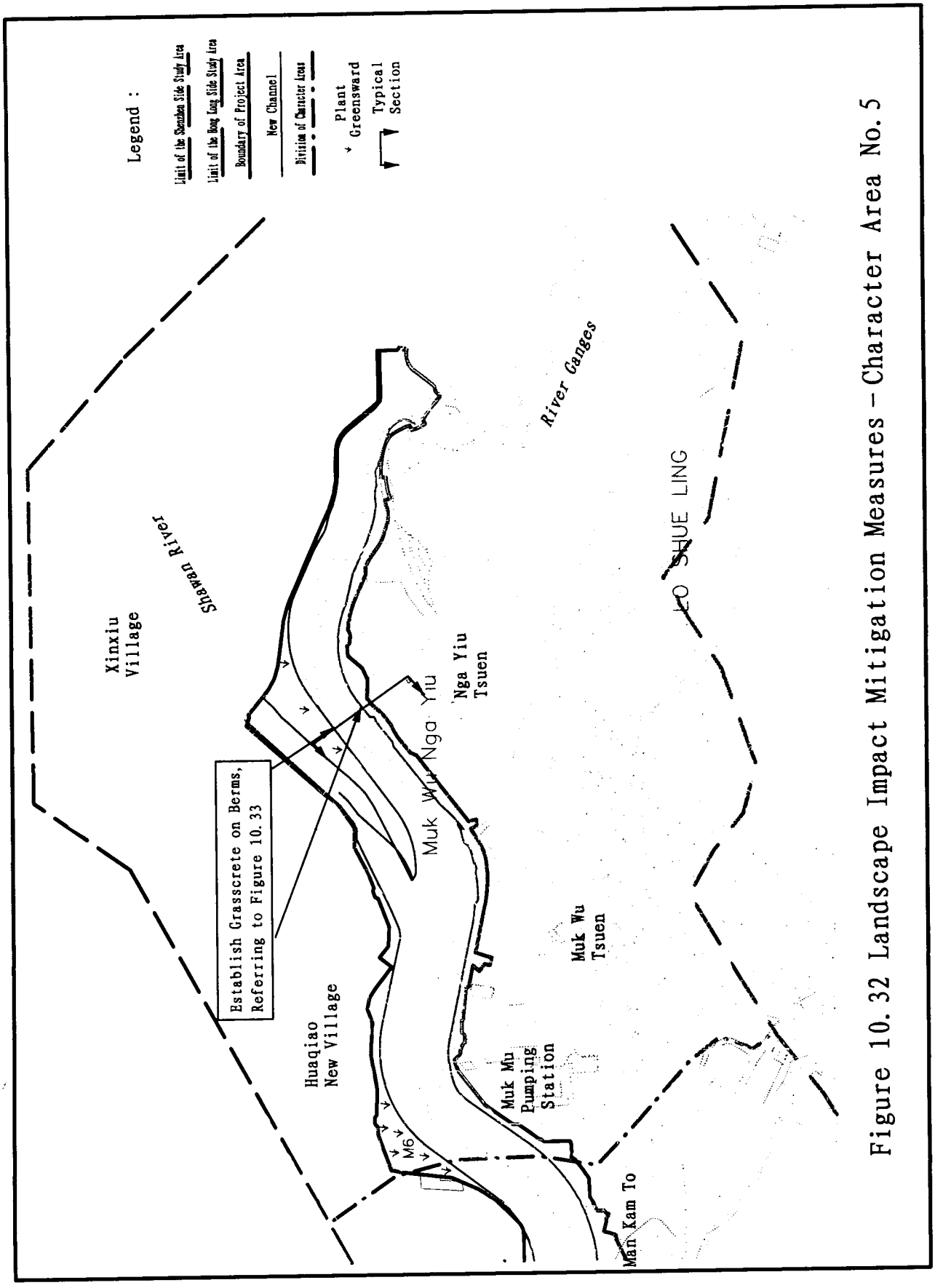


Figure 10.32 Landscape Impact Mitigation Measures – Character Area No. 5

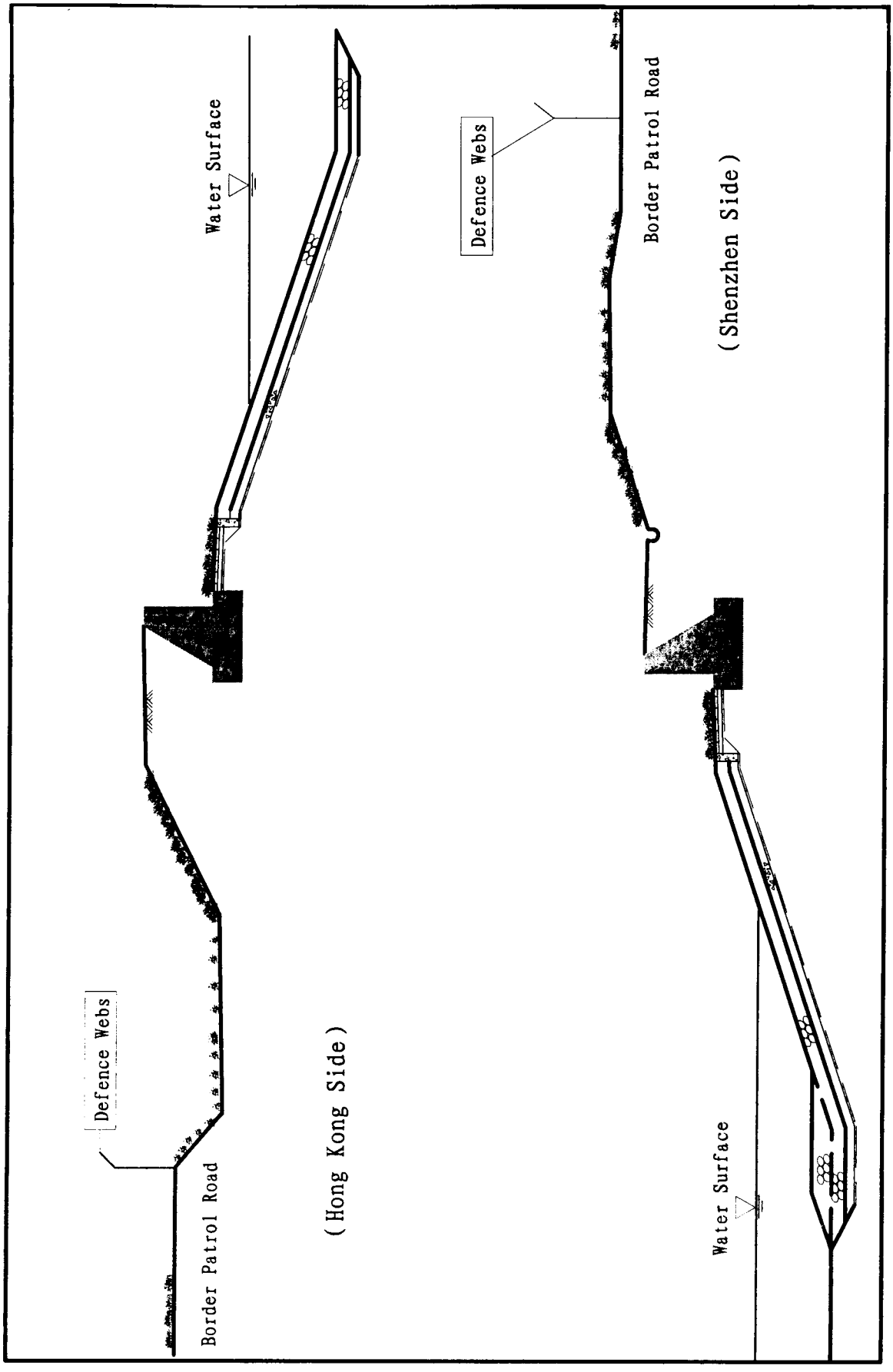


Figure10.33 Landscape Impact Mitigation Measures
-Typical Cross Section(pile No. 12+248. 756)

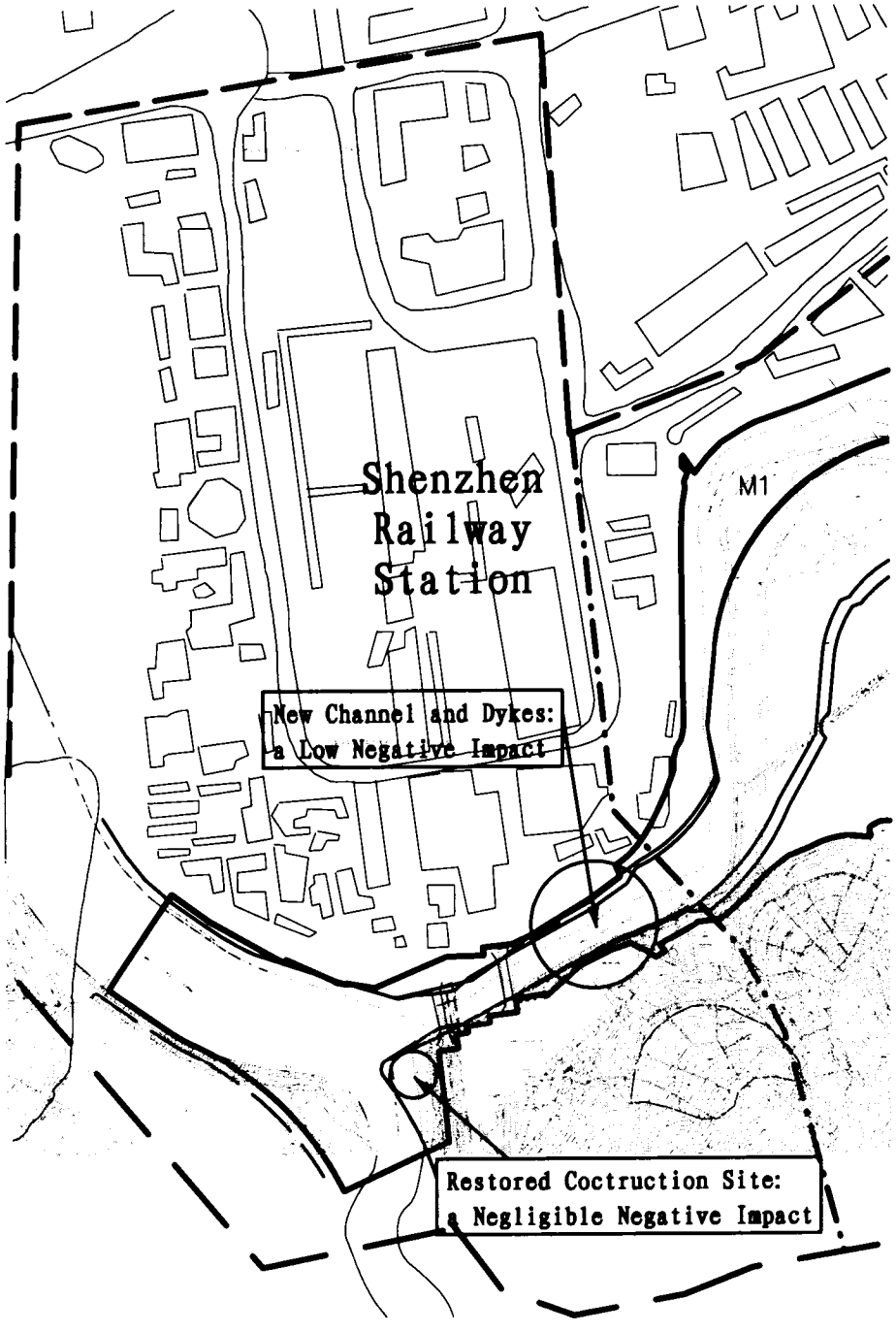


Figure 10.34 Residual Landscape Imapcts on Charater Area No.1 during Construction and Operation Period

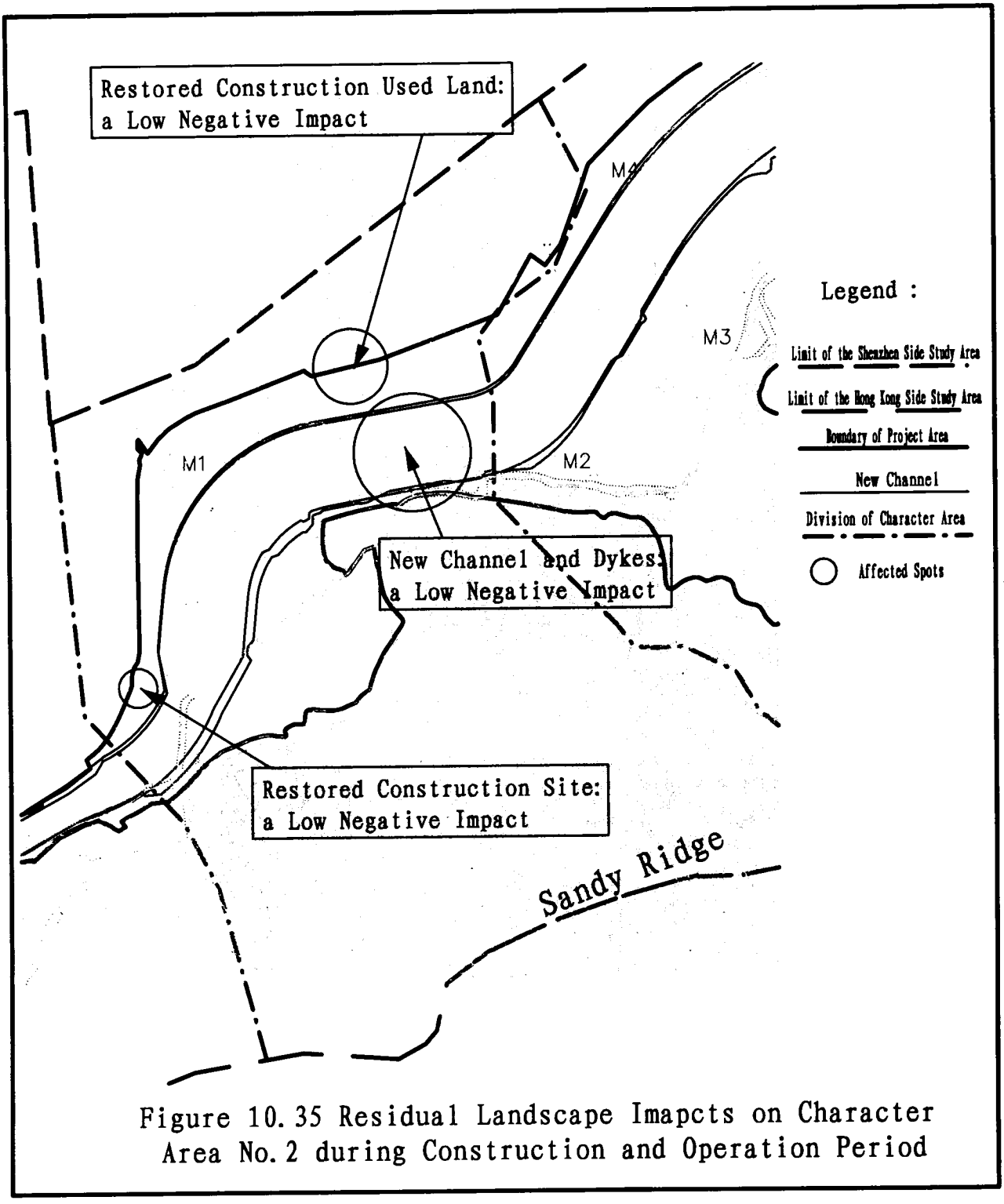


Figure 10.35 Residual Landscape Imapcts on Character Area No. 2 during Construction and Operation Period

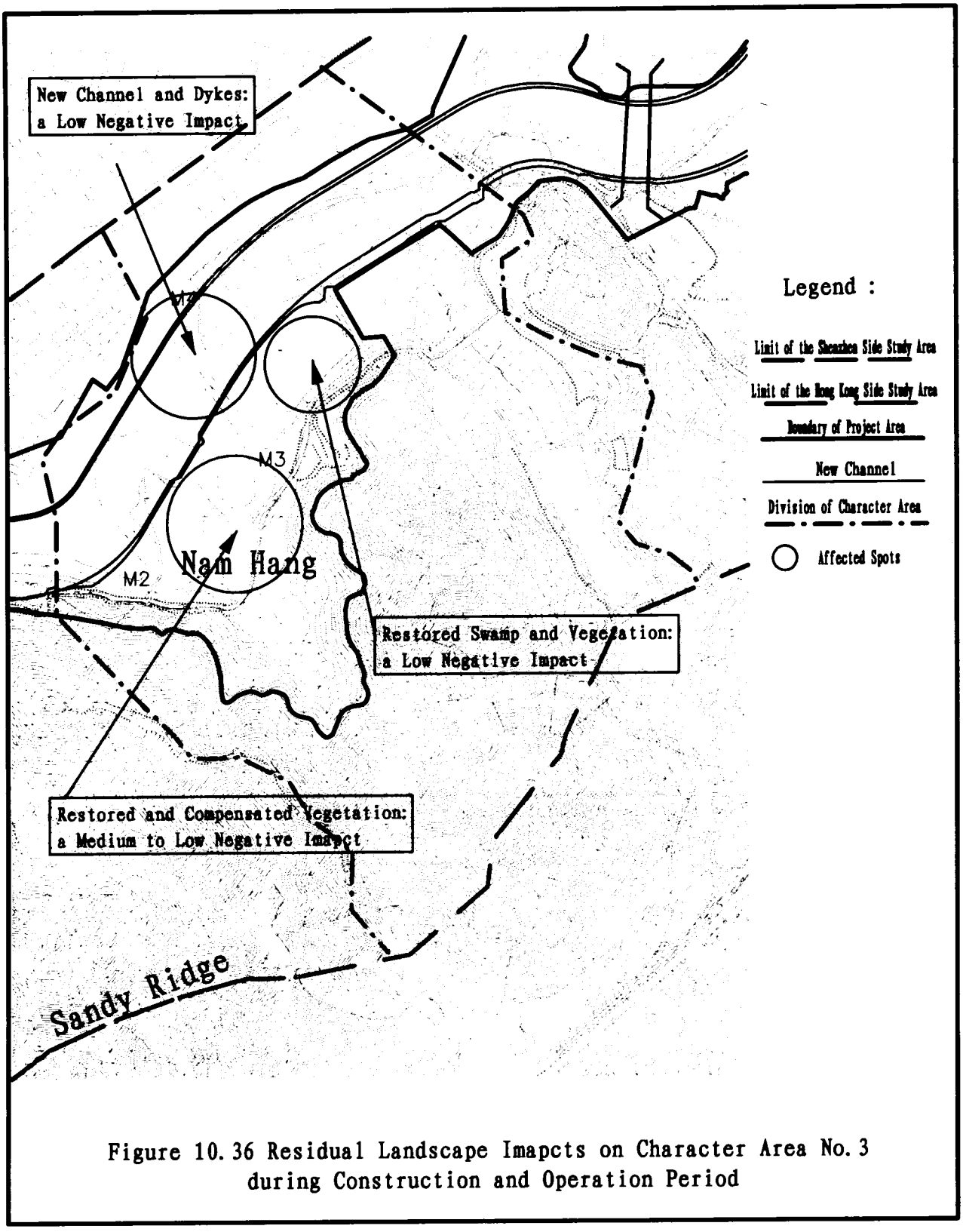


Figure 10.36 Residual Landscape Imapcts on Character Area No. 3 during Construction and Operation Period

Figure 10.37 Residual Landscape Imapcts on Character Area No.4 during Construction and Operation Period

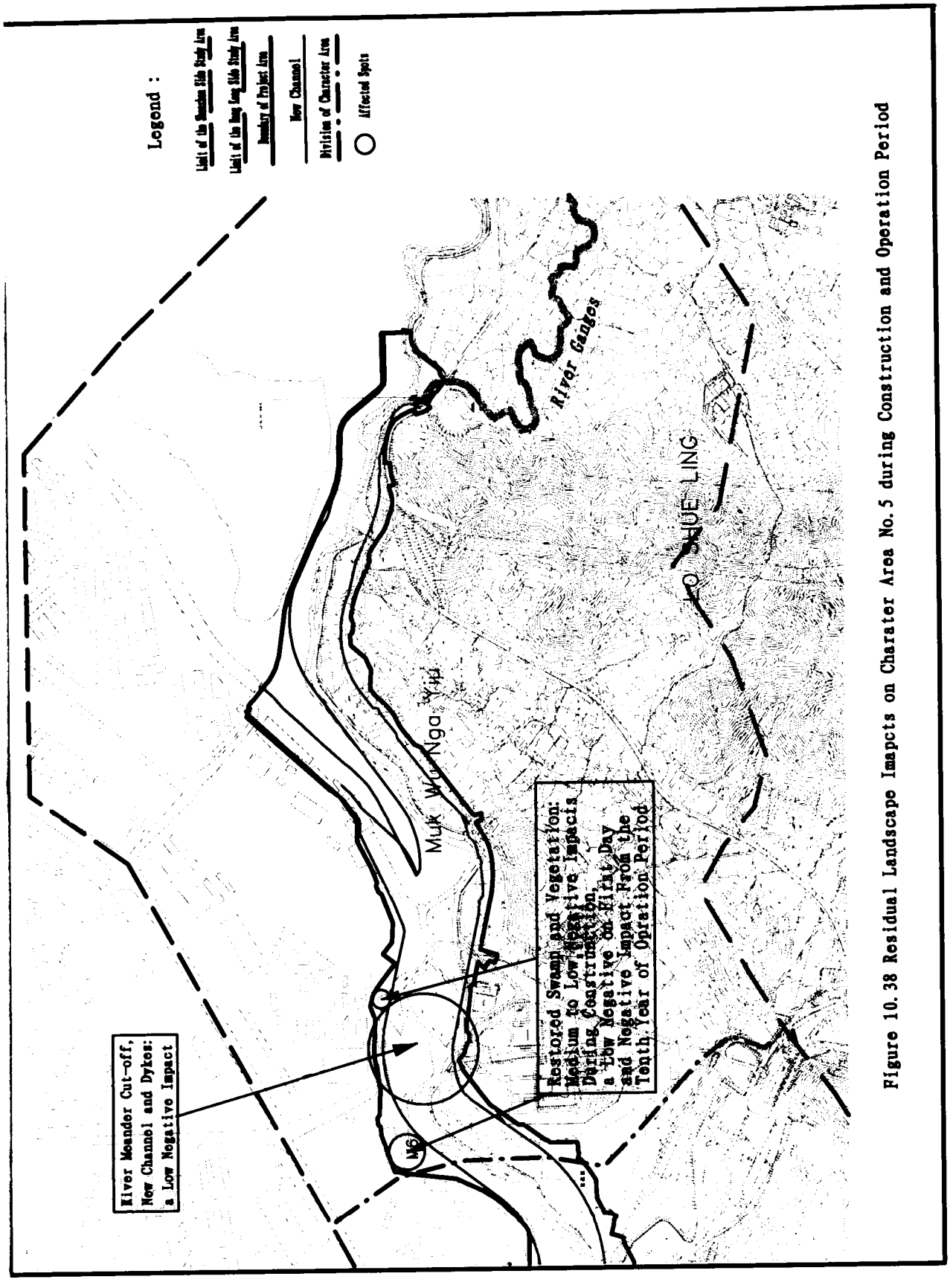


Figure 10.38 Residual Landscape Impacts on Charater Area No.5 during Construction and Operation Period

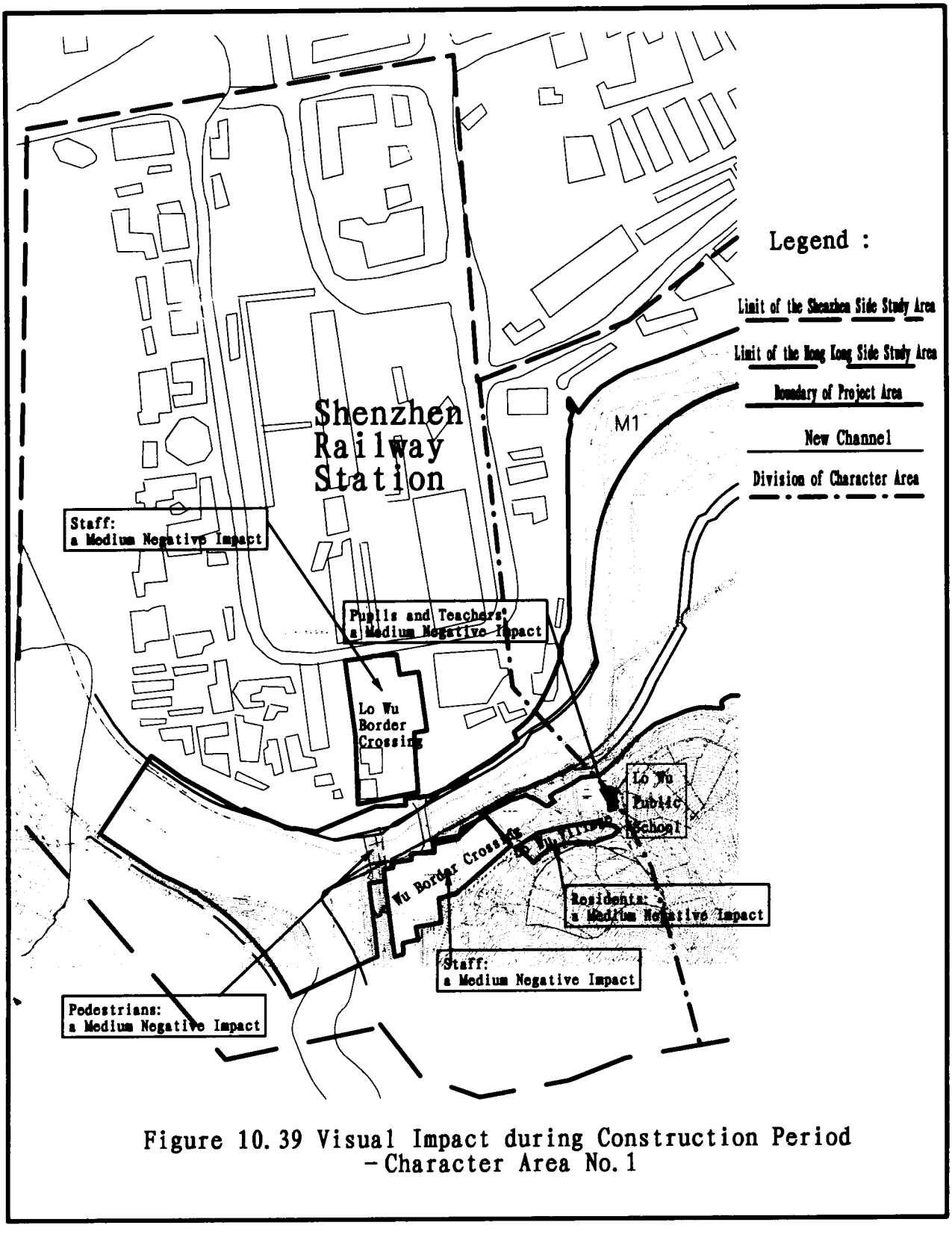


Figure 10.39 Visual Impact during Construction Period
-Character Area No.1

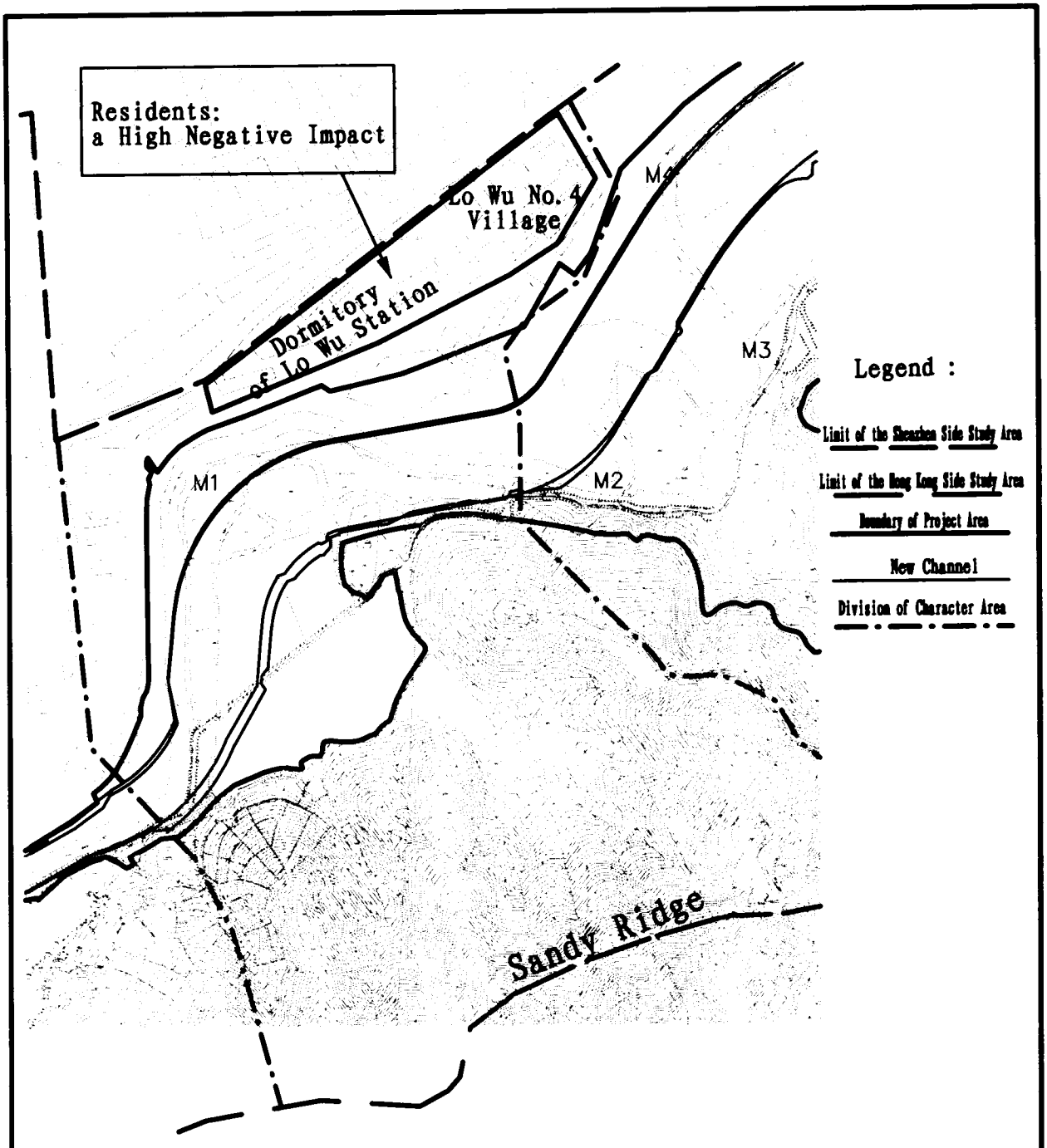


Figure 10.40 Visual Impact during Construction Period
— Character Area No. 2

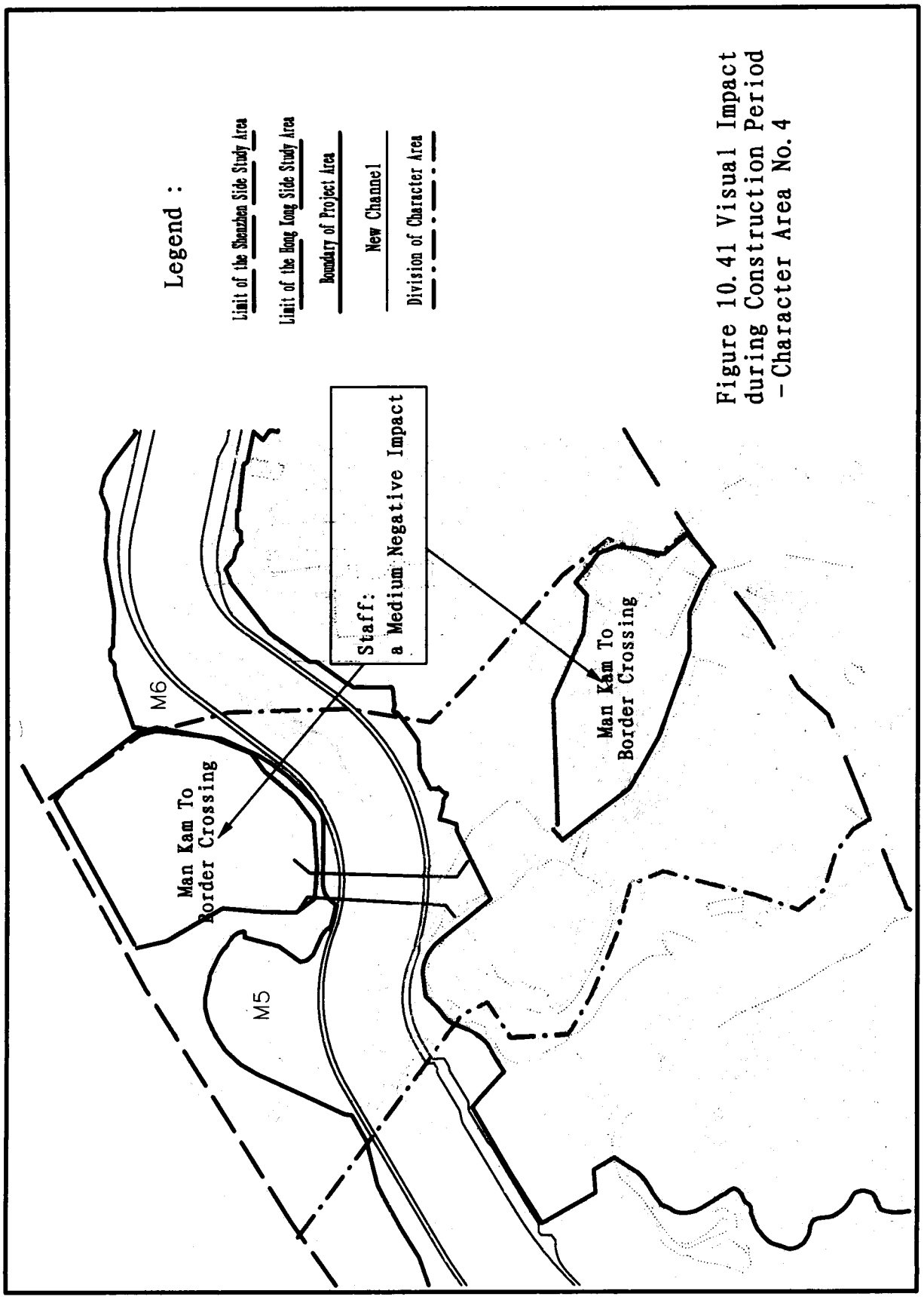


Figure 10.41 Visual Impact during Construction Period - Character Area No. 4

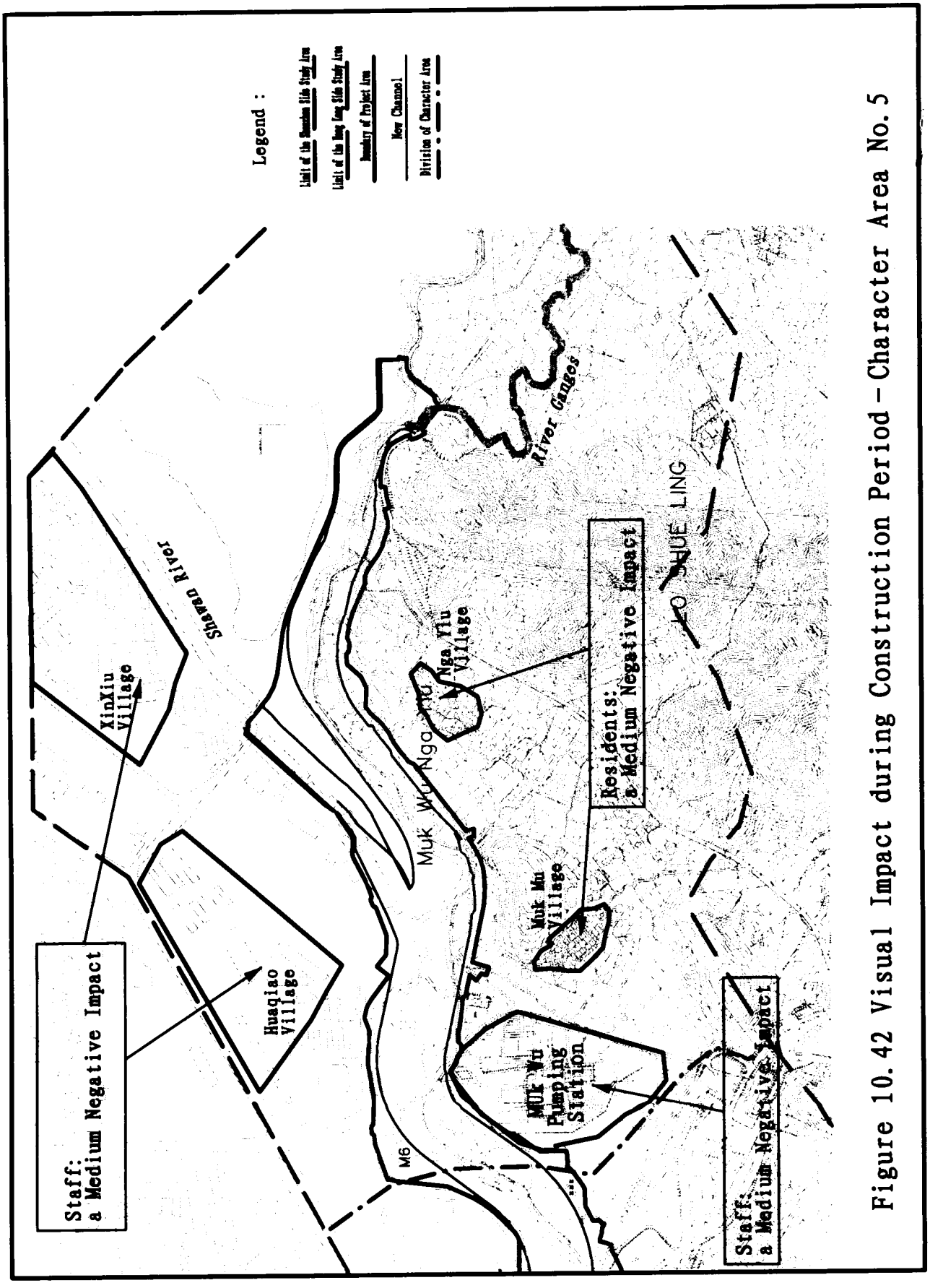


Figure 10.42 Visual Impact during Construction Period - Character Area No. 5

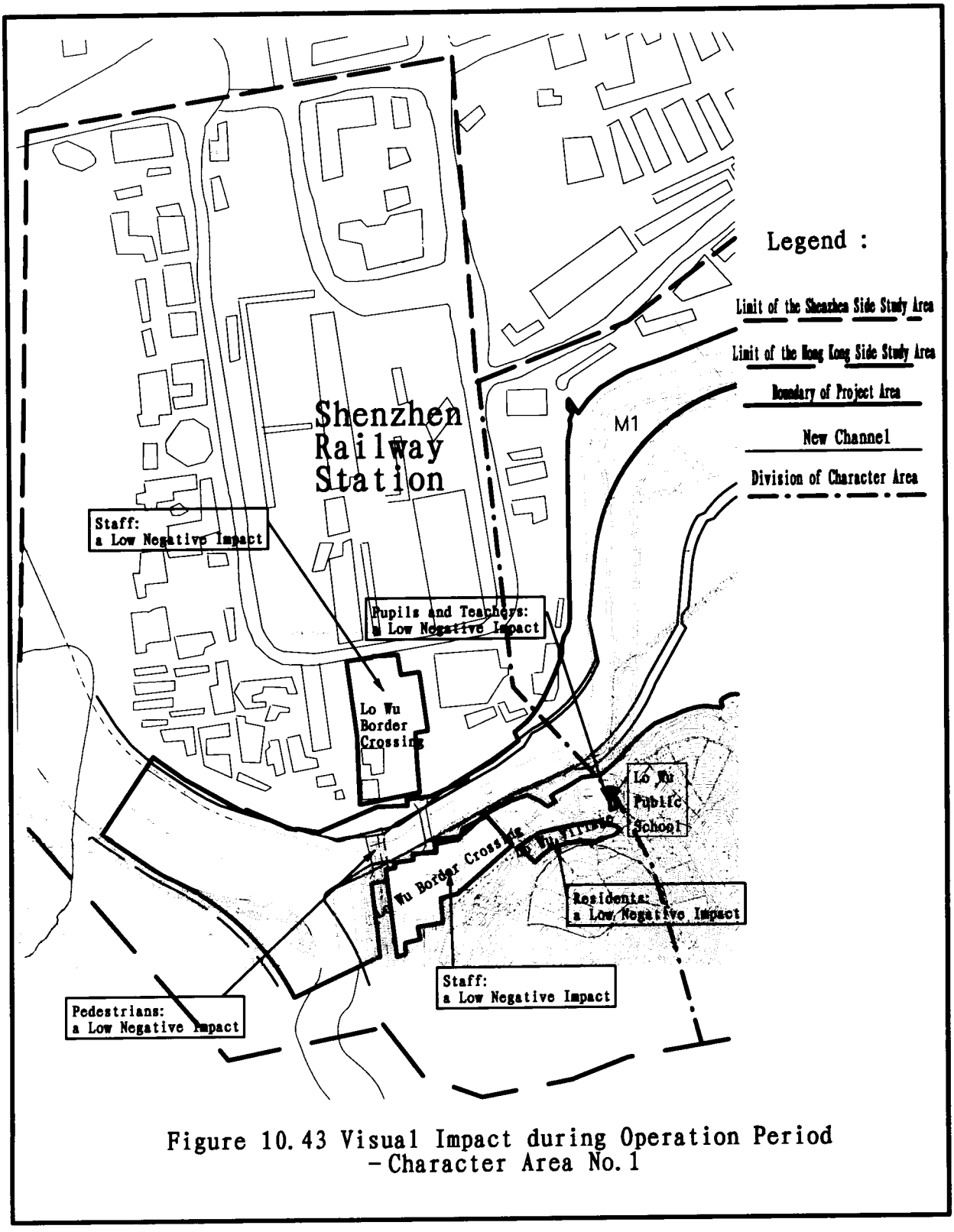


Figure 10.43 Visual Impact during Operation Period
- Character Area No.1

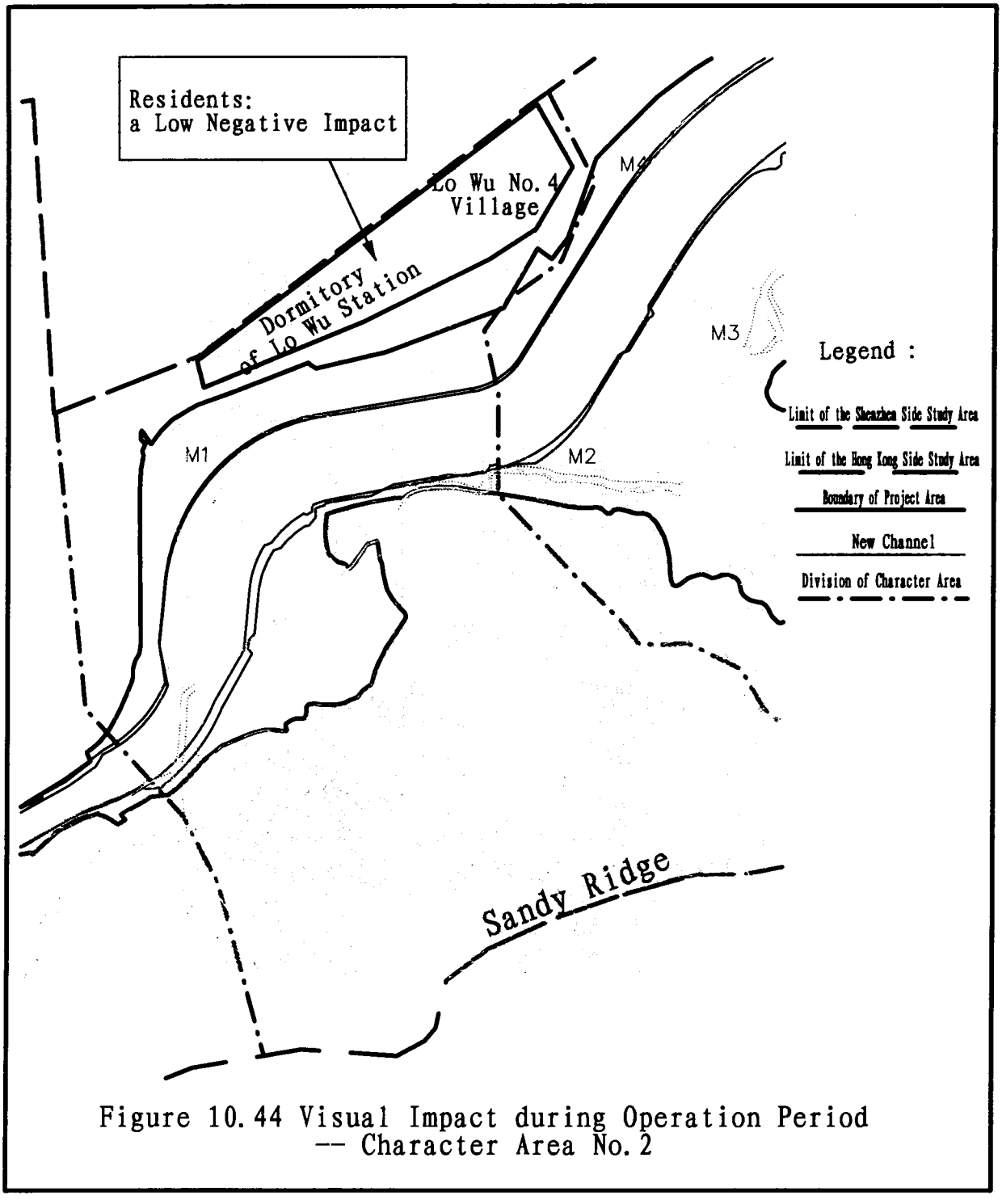


Figure 10.44 Visual Impact during Operation Period
-- Character Area No. 2

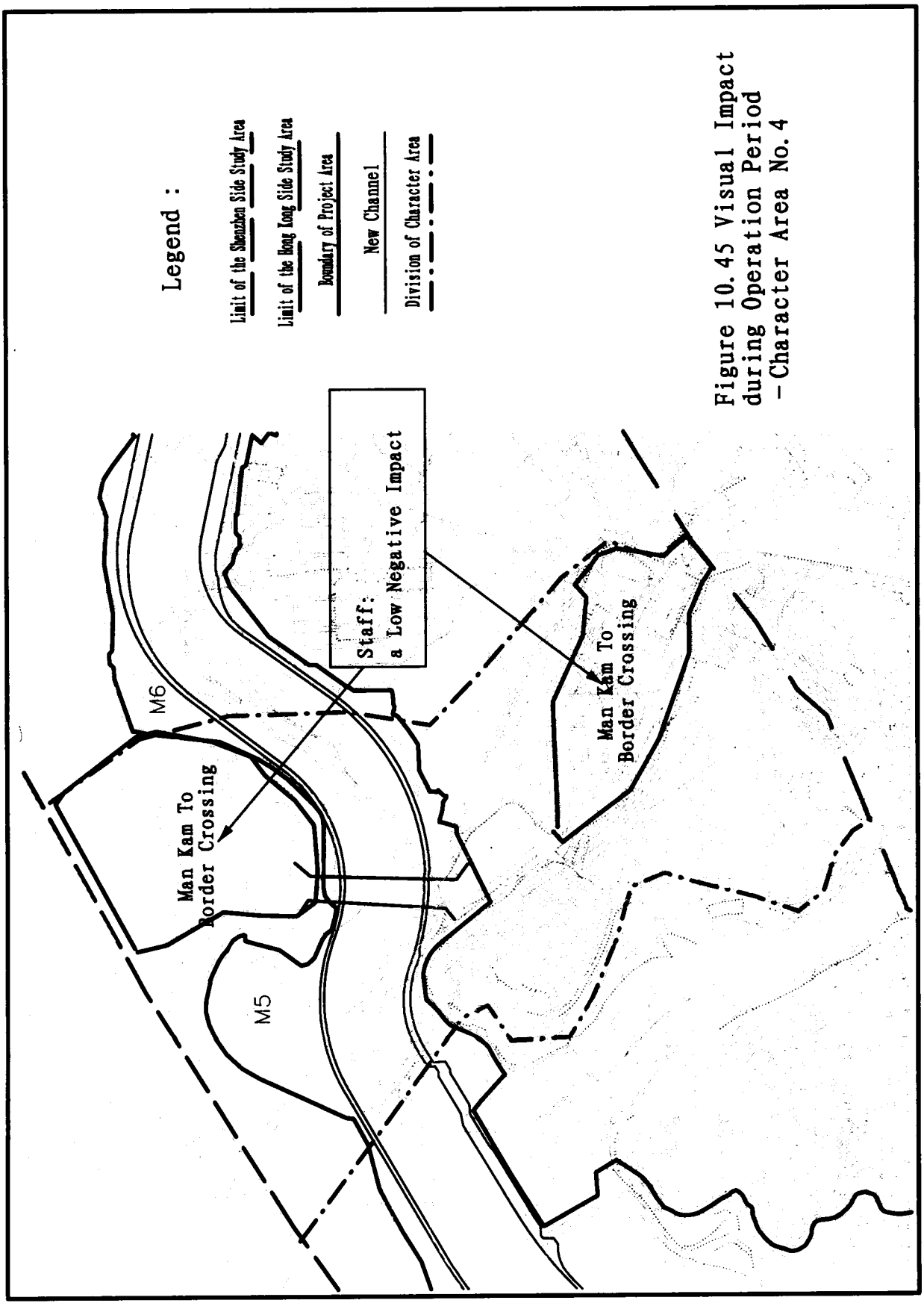


Figure 10.45 Visual Impact during Operation Period -Character Area No.4

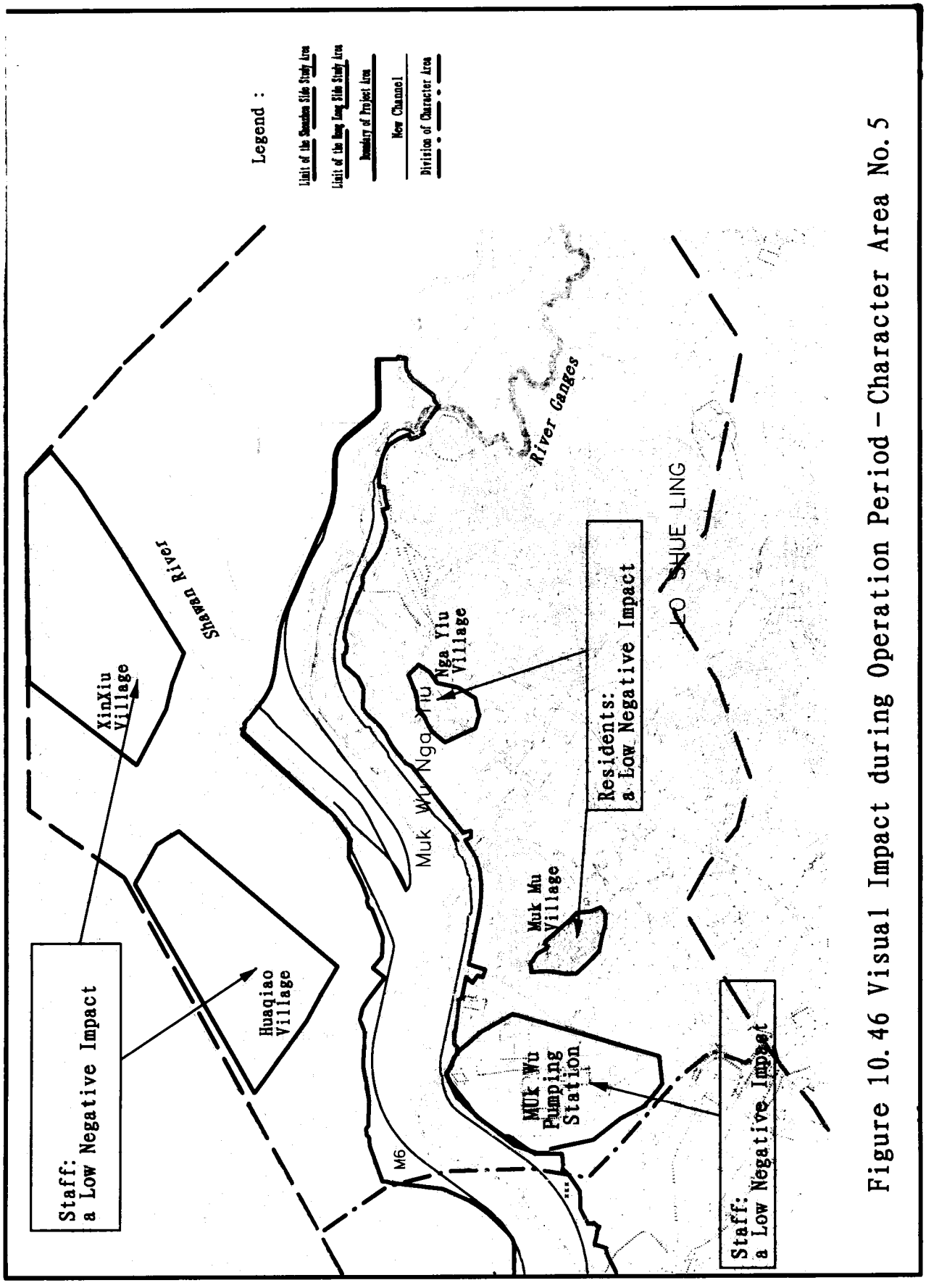


Figure 10.46 Visual Impact during Operation Period – Character Area No. 5

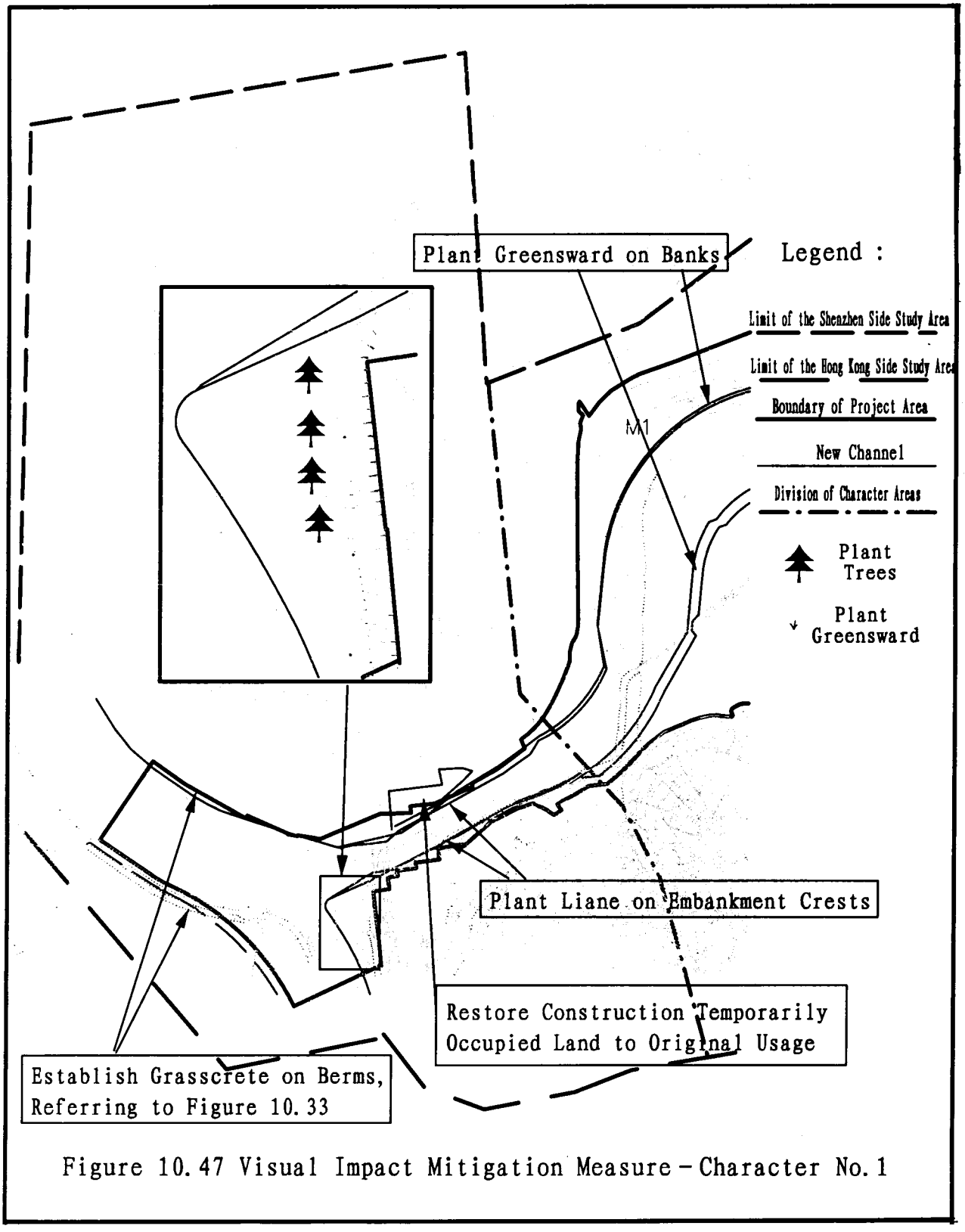


Figure 10.47 Visual Impact Mitigation Measure - Character No. 1

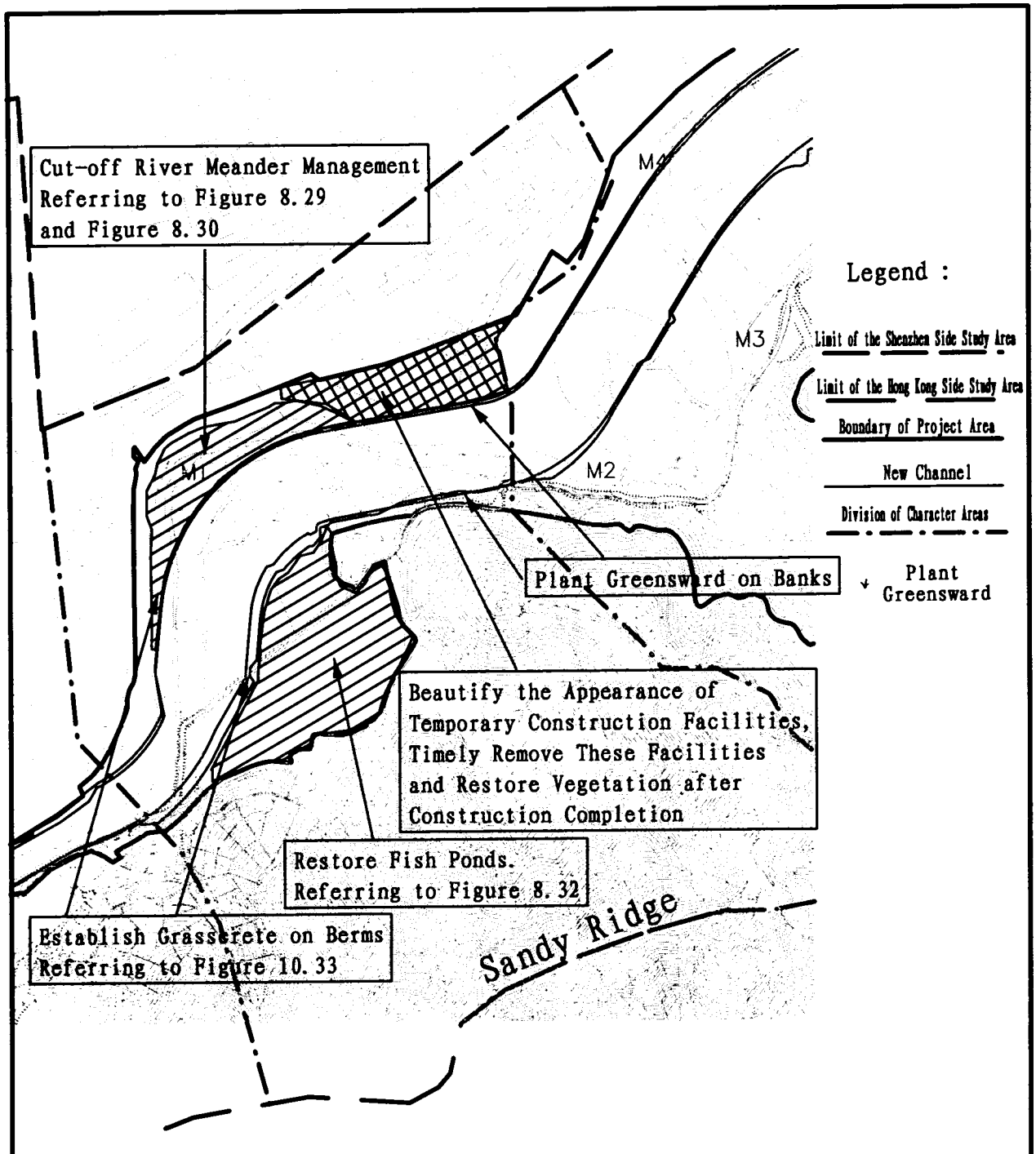
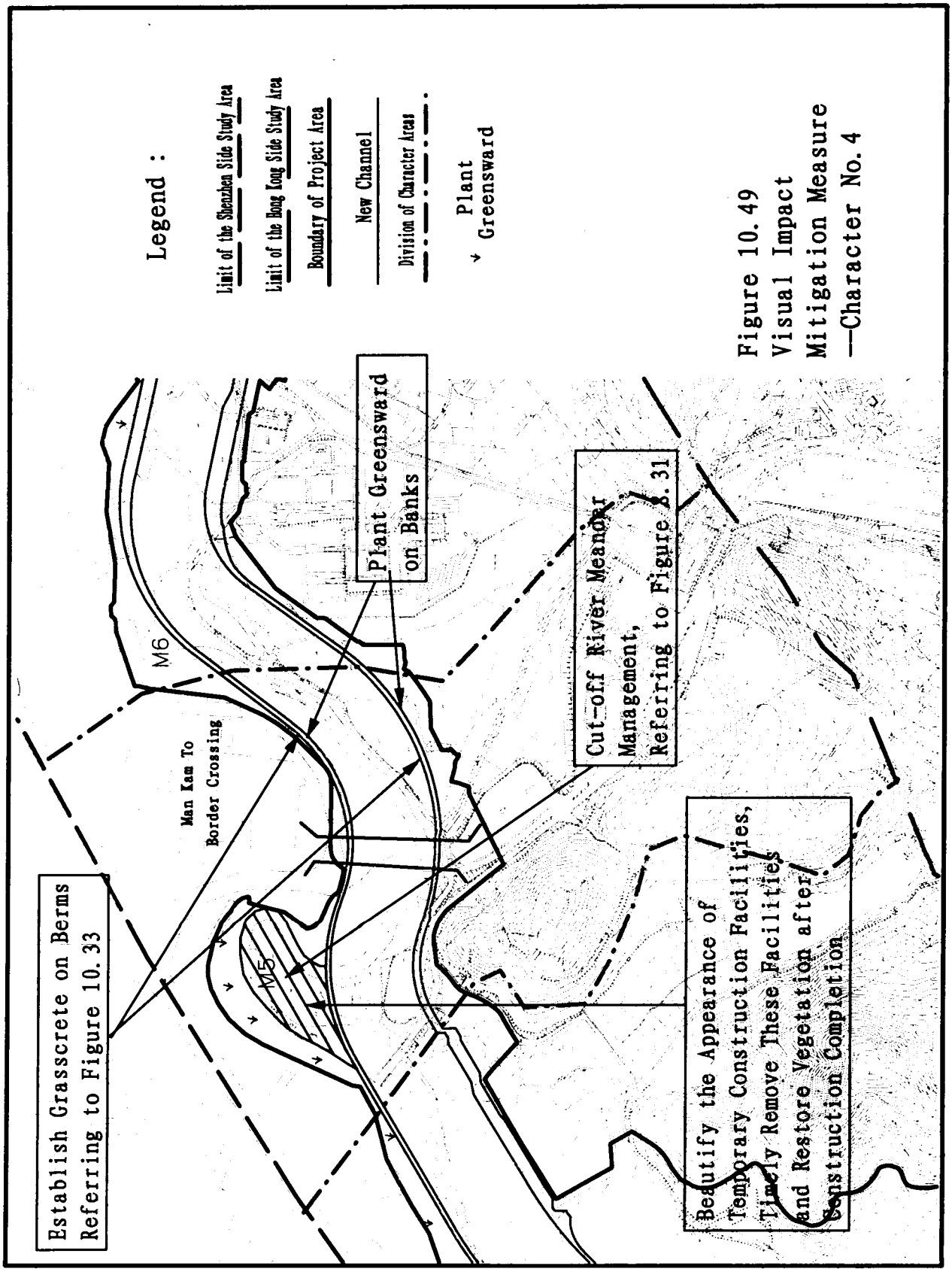


Figure 10.48 Visual Impact Mitigation Measure
- Character No. 2


Legend :
Limit of the Shenzhen Side Study Area
Limit of the Hong Kong Side Study Area
Boundary of Project Area
New Channel
Division of Character Areas
Plant
Greensward
Figure 10.49
Visual Impact
Mitigation Measure
—Character No. 4
Establish Grasscrete on Berms Referring to Figure 10.33
Man Kam To Border Crossing
M6
M5
Plant Greensward on Banks
Cut-off River Meander Management, Referring to Figure 8.31
Beautify the Appearance of Temporary Construction Facilities, Timely Remove These Facilities and Restore Vegetation after Construction Completion

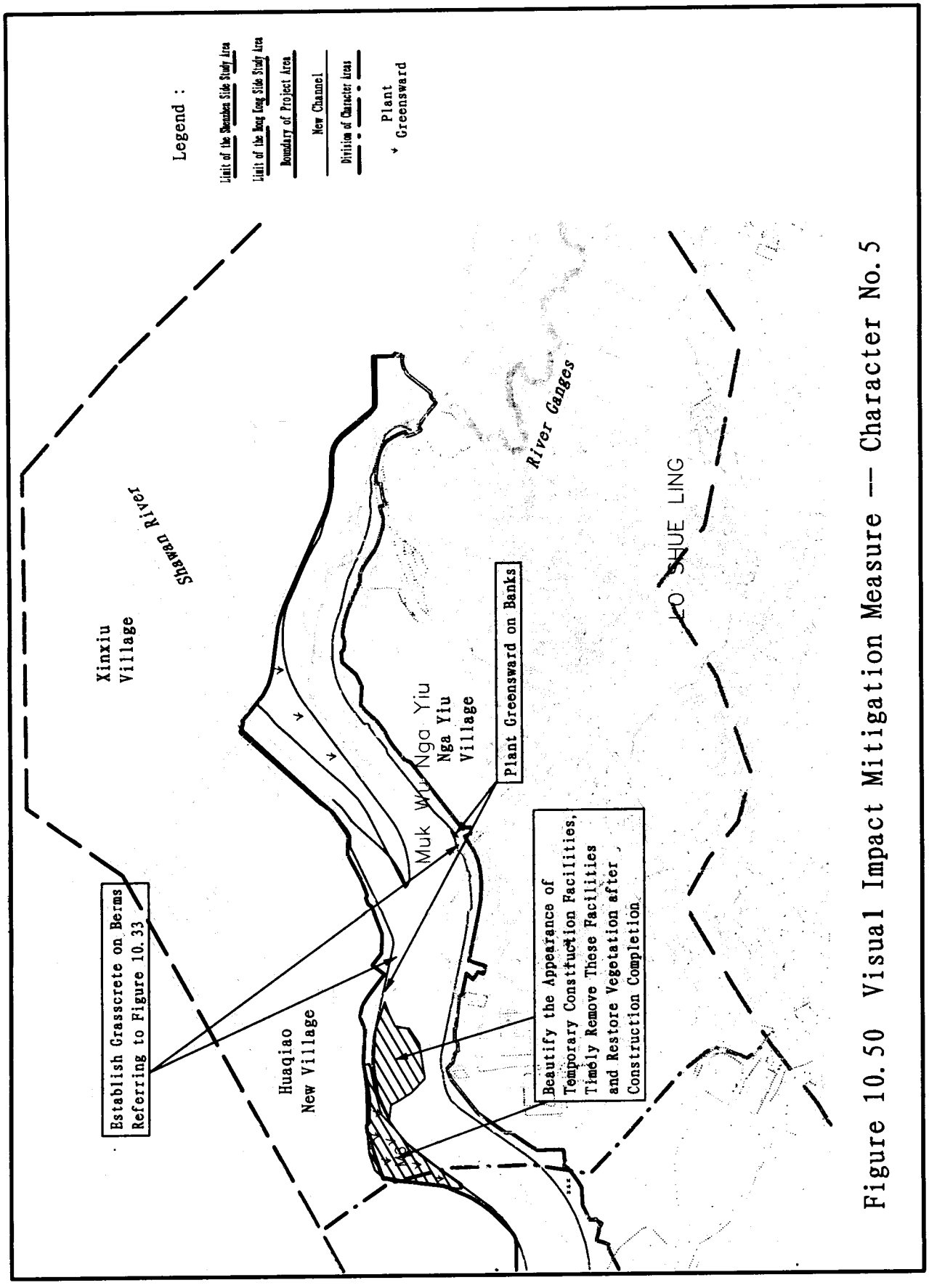


Figure 10.50 Visual Impact Mitigation Measure — Character No. 5

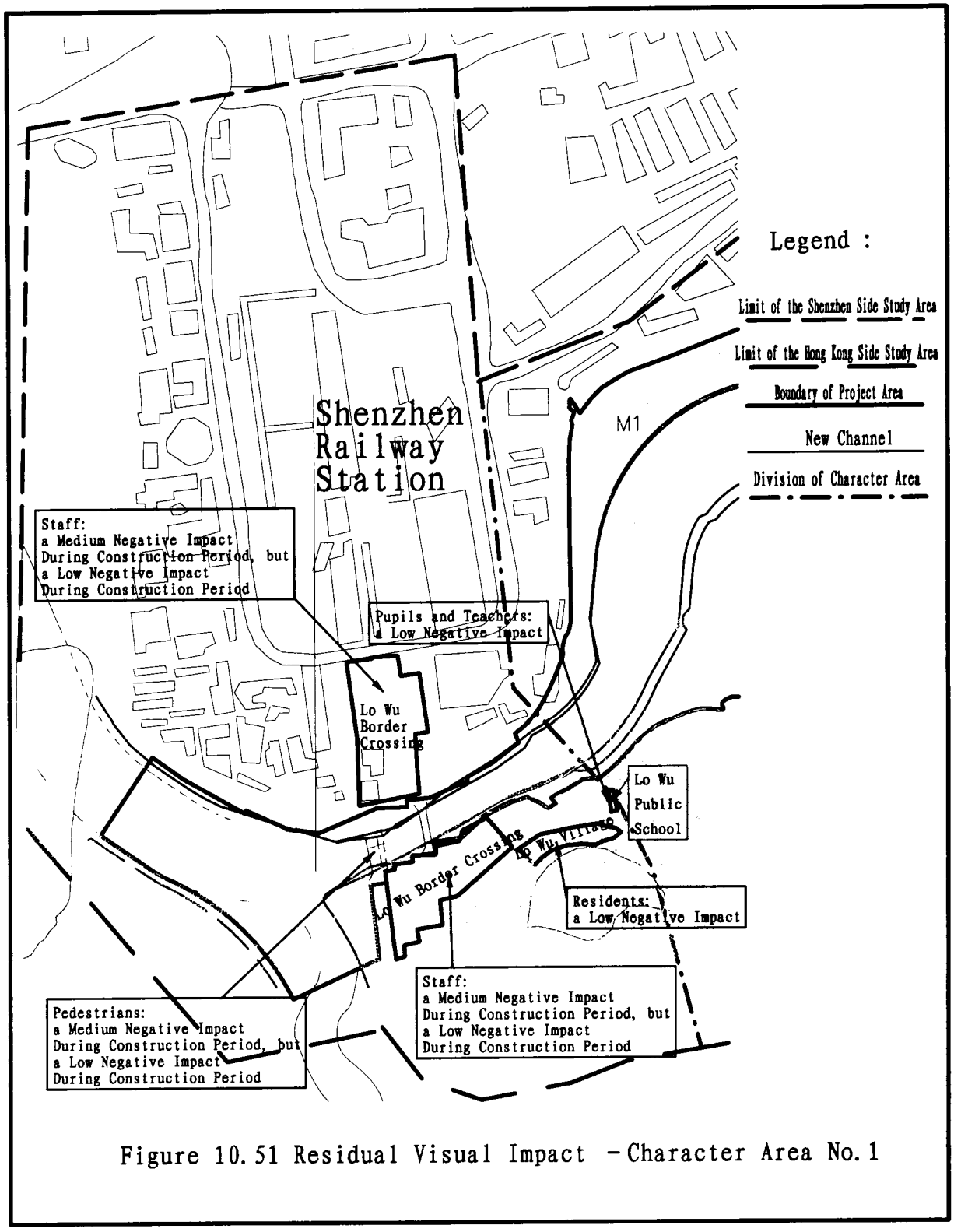


Figure 10.51 Residual Visual Impact - Character Area No.1

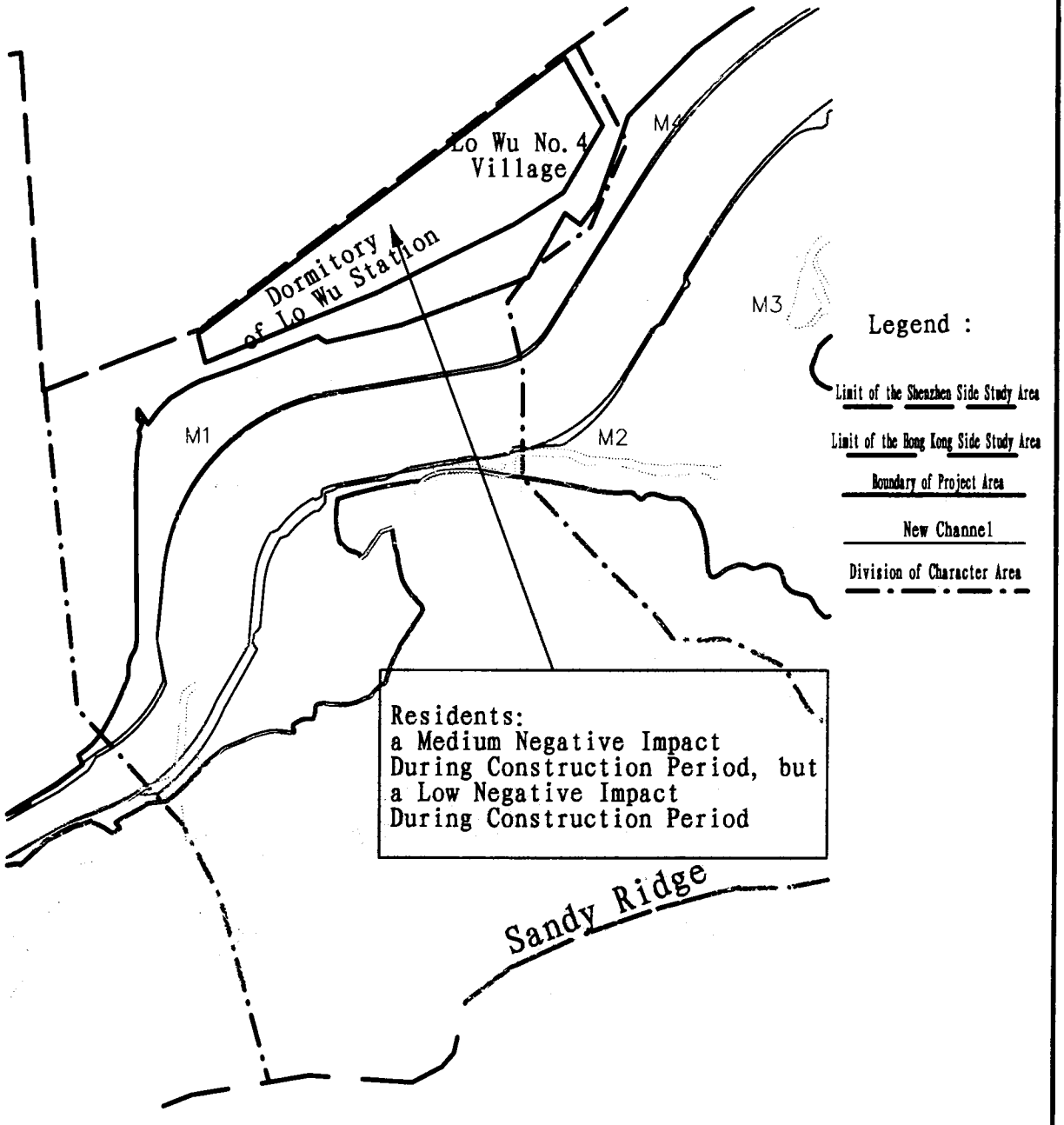


Figure 10.52 Residual Visual Impact -- Character Area No. 2

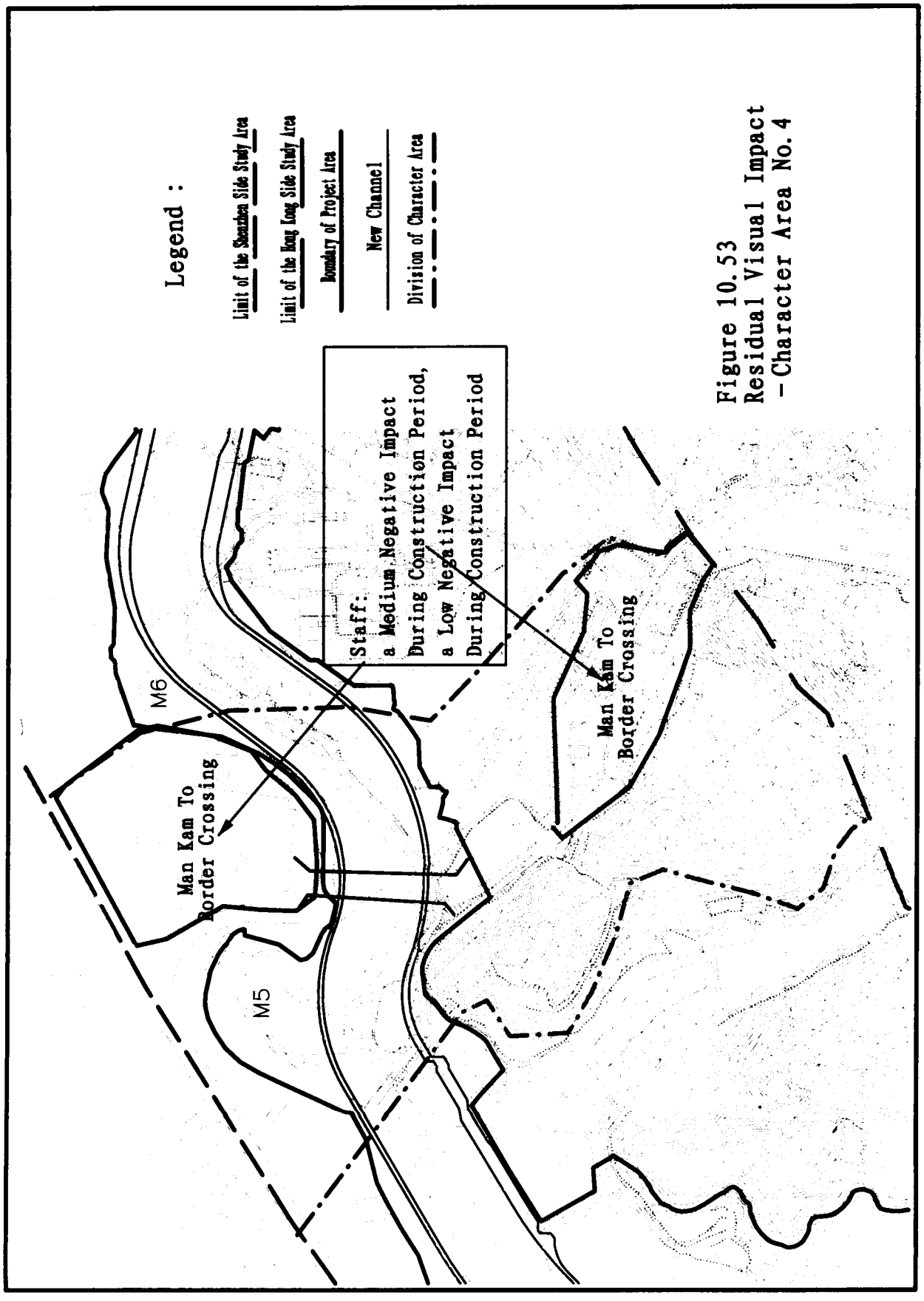


Figure 10.53
Residual Visual Impact
- Character Area No. 4

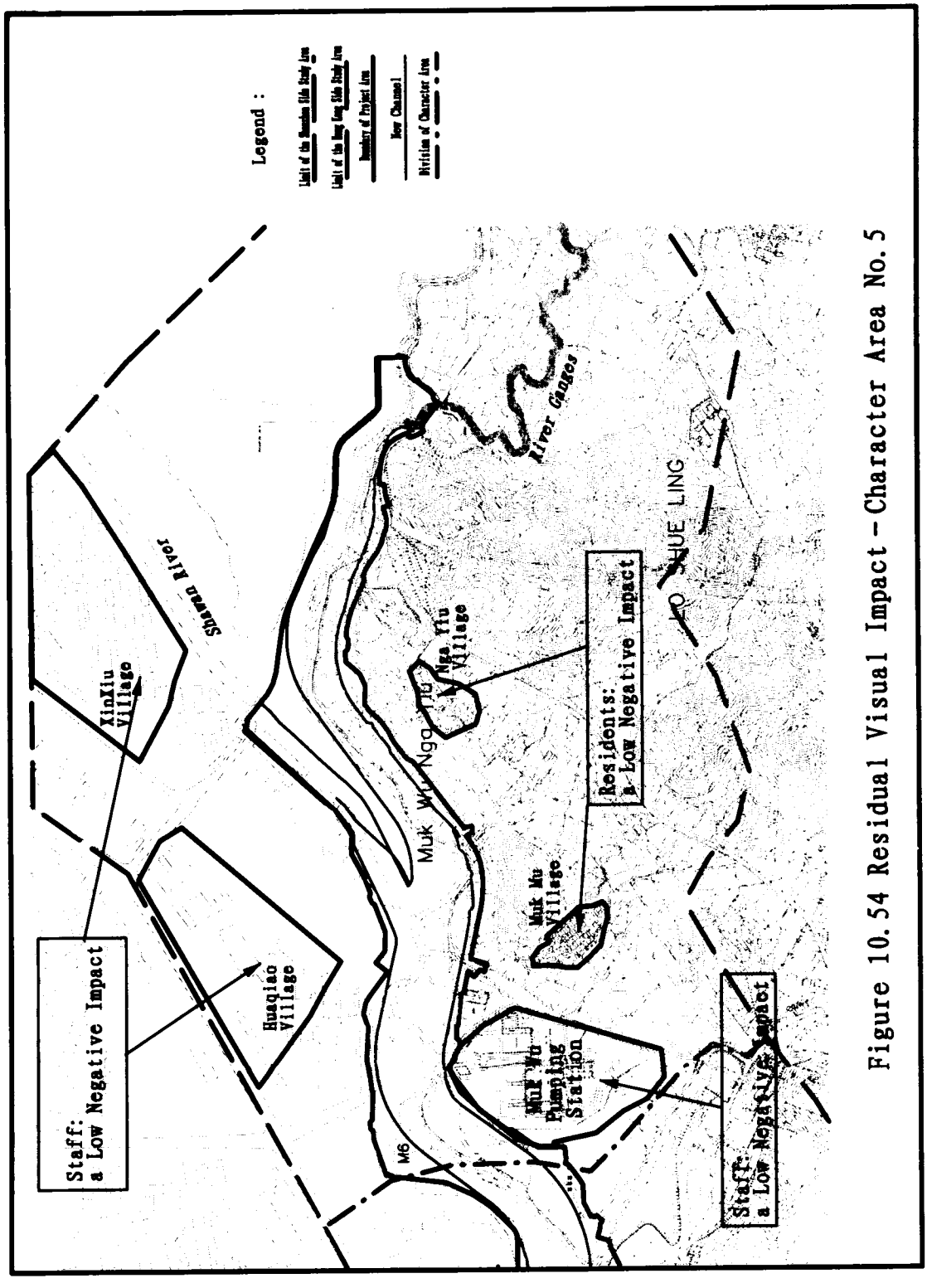


Figure 10.54 Residual Visual Impact - Character Area No. 5