

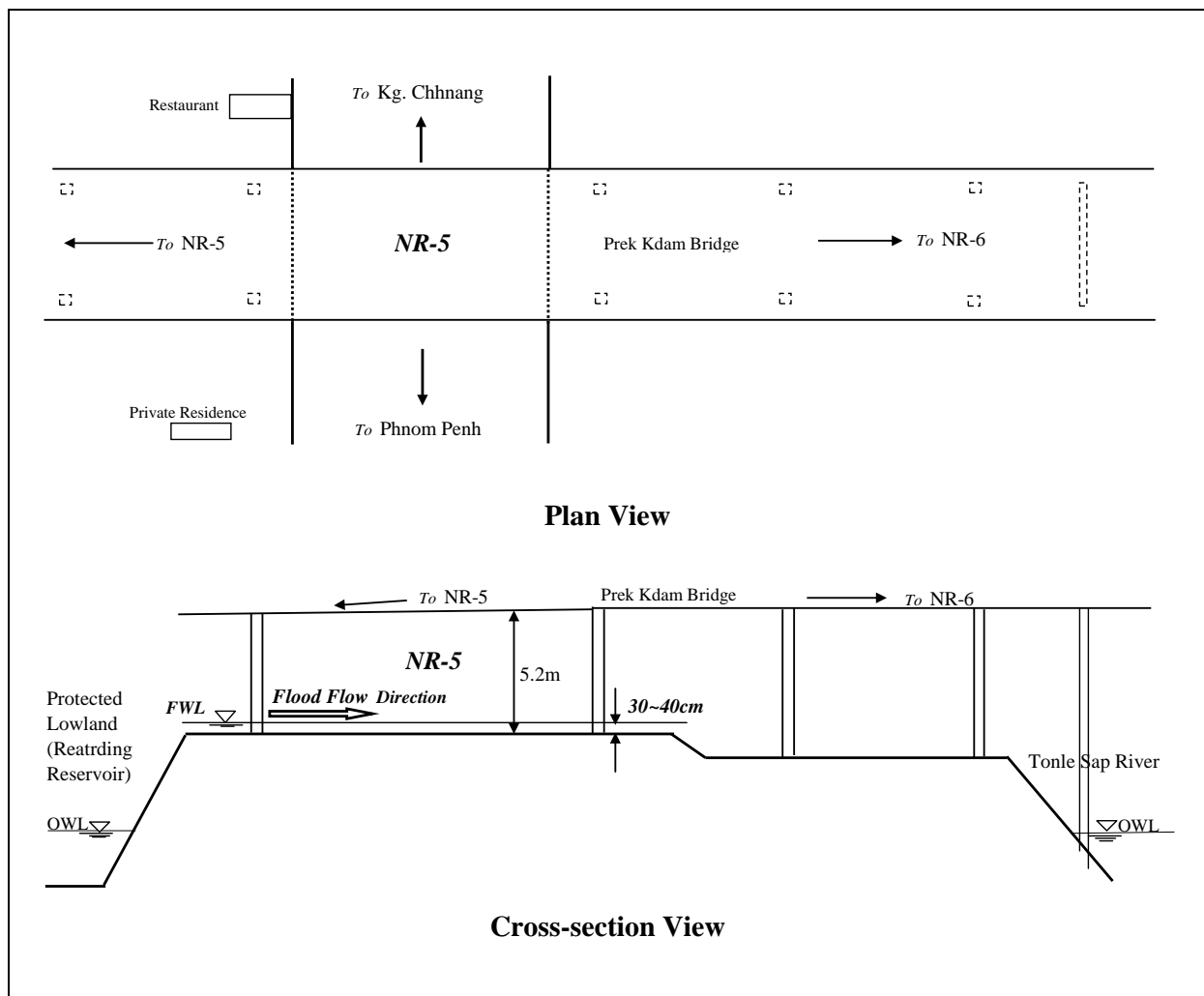
**APPENDIX 7-2**

**INQUIRING SURVEY  
ON  
INFORMATION  
OF  
FLOOD CONDITIONS**



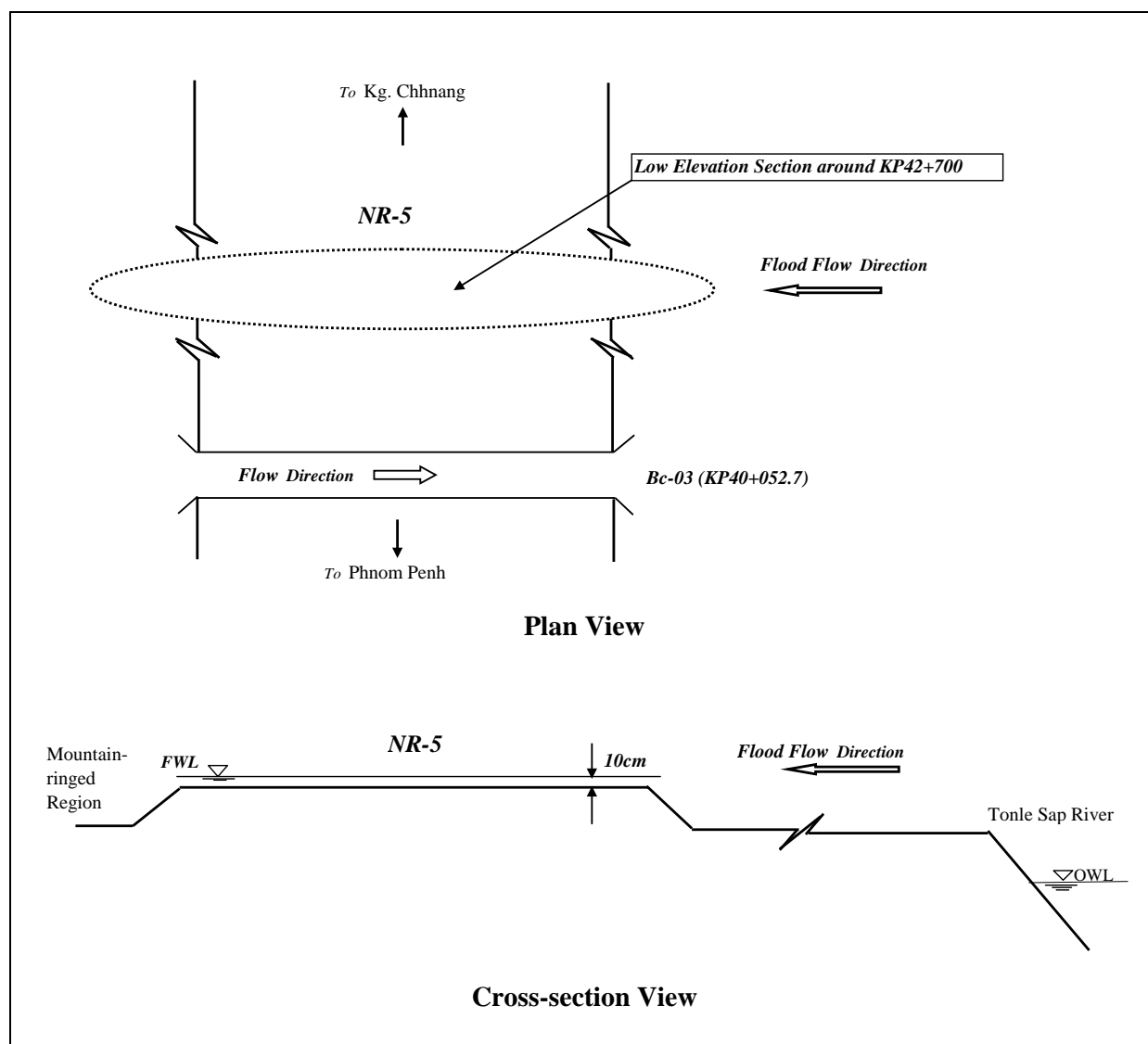
## Inventory Sheet on Information of Flooding Conditions

|                           |  |  |
|---------------------------|--|--|
|                           | <b>No.:</b>  | 1  |
| <b>Date</b>               | 2 <sup>nd</sup> October 2012   |  |
| <b>Interview with</b>     | Mr. Nhem Sorn (restaurant's cook), 52-years-old<br>Ms. Chhourn Poev (street vendor nearby her house), 62-years-old |  |
| <b>PK (km)</b>            | 31+000   | <b>Province</b> Kampong Chhnang  |
| <b>Circumstance</b>       | Hout Chan Restaurant close to Prek Kdam Bridge<br>Commercial area and residential area                             |  |
| <b>Drainage Facility</b>  | None   |  |
| <b>Flood Level</b>        | 30 ~ 40cm around piers   | <b>Flood Flow Direction</b> Protected lowland (Retarding Reservoir)<br>→ Tonle Sap River |
| <b>Frequency</b>          | Seldom   |  |
| <b>Duration Per Flood</b> | 1 month  | <b>Occurrence Month</b> October ~ November 2011  |



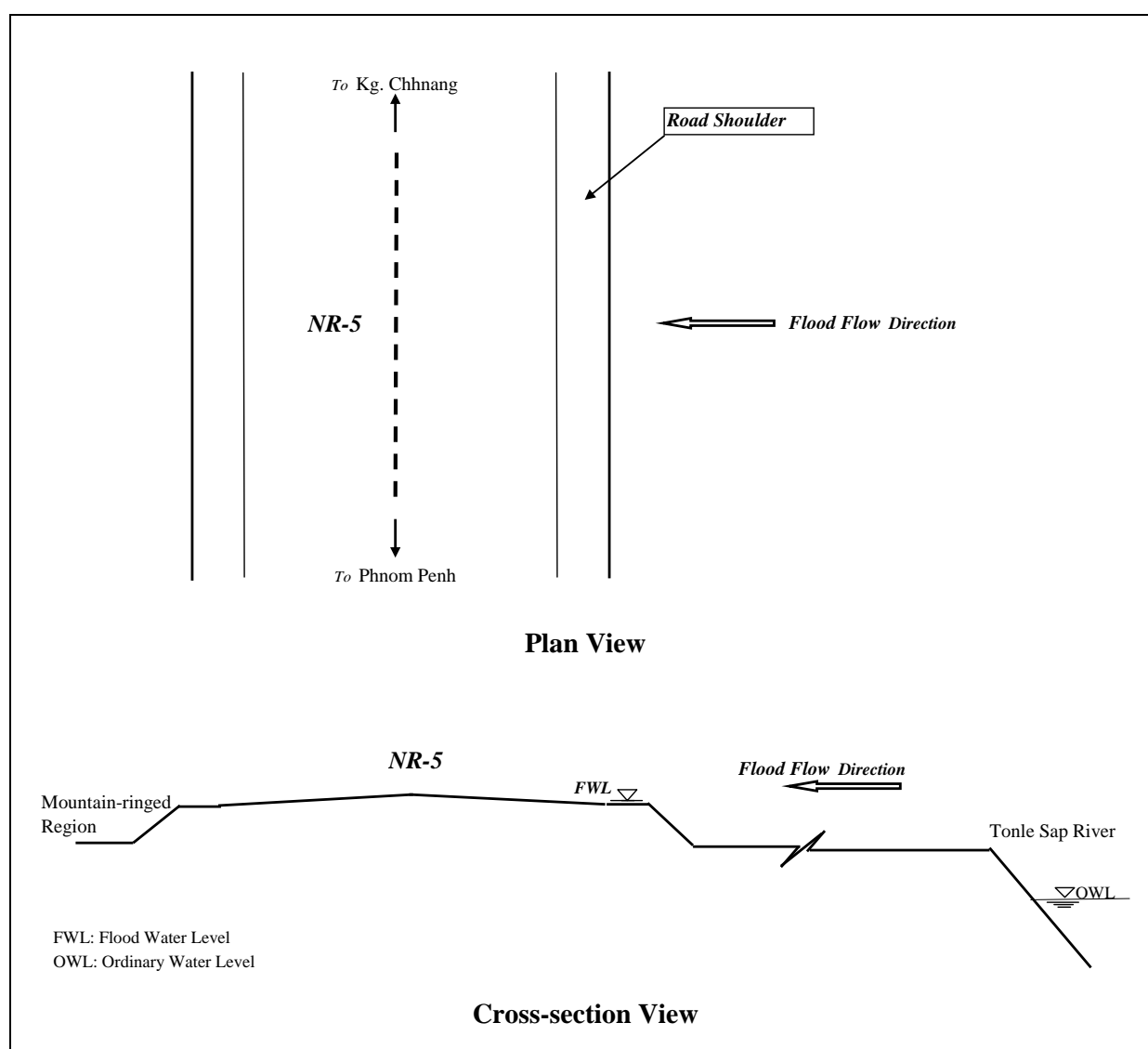
## Inventory Sheet on Information of Flooding Conditions

|                           |                                  |                             |   |
|---------------------------|----------------------------------|-----------------------------|---|
|                           |                                  | <b>No.:</b>                 | 2   |
| <b>Date</b>               | 2 <sup>nd</sup> October 2012     |                             |   |
| <b>Interview with</b>     | Ms. Khim Sreytouch, 32-years-old |                             |   |
| <b>PK (km)</b>            | 42+700                           | <b>Province</b>             | Kampong Chhnang                             |
| <b>Circumstance</b>       | Lhsar Trach                      |                             |   |
| <b>Drainage Facility</b>  | None                             |                             |   |
| <b>Flood Level</b>        | 10cm                             | <b>Flood Flow Direction</b> | Tonle Sap River →<br>Mountain-ringed Region |
| <b>Frequency</b>          | 1-yr (every year)                |                             |   |
| <b>Duration Per Flood</b> | 1 month                          | <b>Occurrence Month</b>     | October ~ November<br>2011                  |



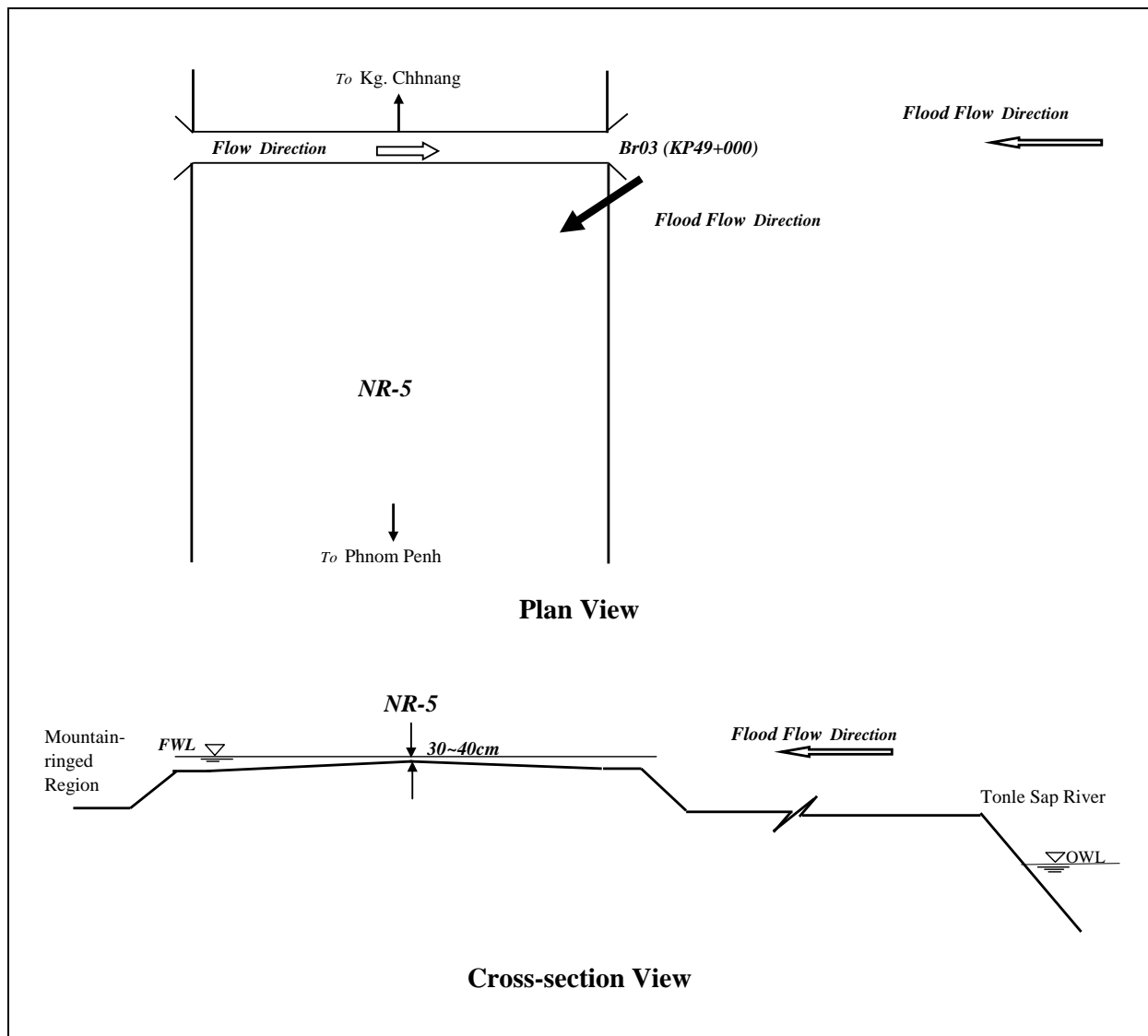
## Inventory Sheet on Information of Flooding Conditions

|                           |  |  |
|---------------------------|--|--|
|                           | <b>No.:</b>                                    | 3  |
| <b>Date</b>               | 2 <sup>nd</sup> October 2012                   |  |
| <b>Interview with</b>     | Ms. Nhem Sorn (Owner of Grocery), 50-years-old |  |
| <b>PK (km)</b>            | 45+400   | <b>Province</b><br>Kampong Chhnang   |
| <b>Circumstance</b>       | Chamka Svay, Unlung Thnout Village             |  |
| <b>Drainage Facility</b>  | None   |  |
| <b>Flood Level</b>        | Road shoulder flooded only                     | <b>Flood Flow Direction</b><br>Tonle Sap River →<br>Mountain-ringed Region |
| <b>Frequency</b>          | 1-yr (every year)                              |  |
| <b>Duration Per Flood</b> | 3 ~ 4 days                                     | <b>Occurrence Month</b><br>October 2011                                    |



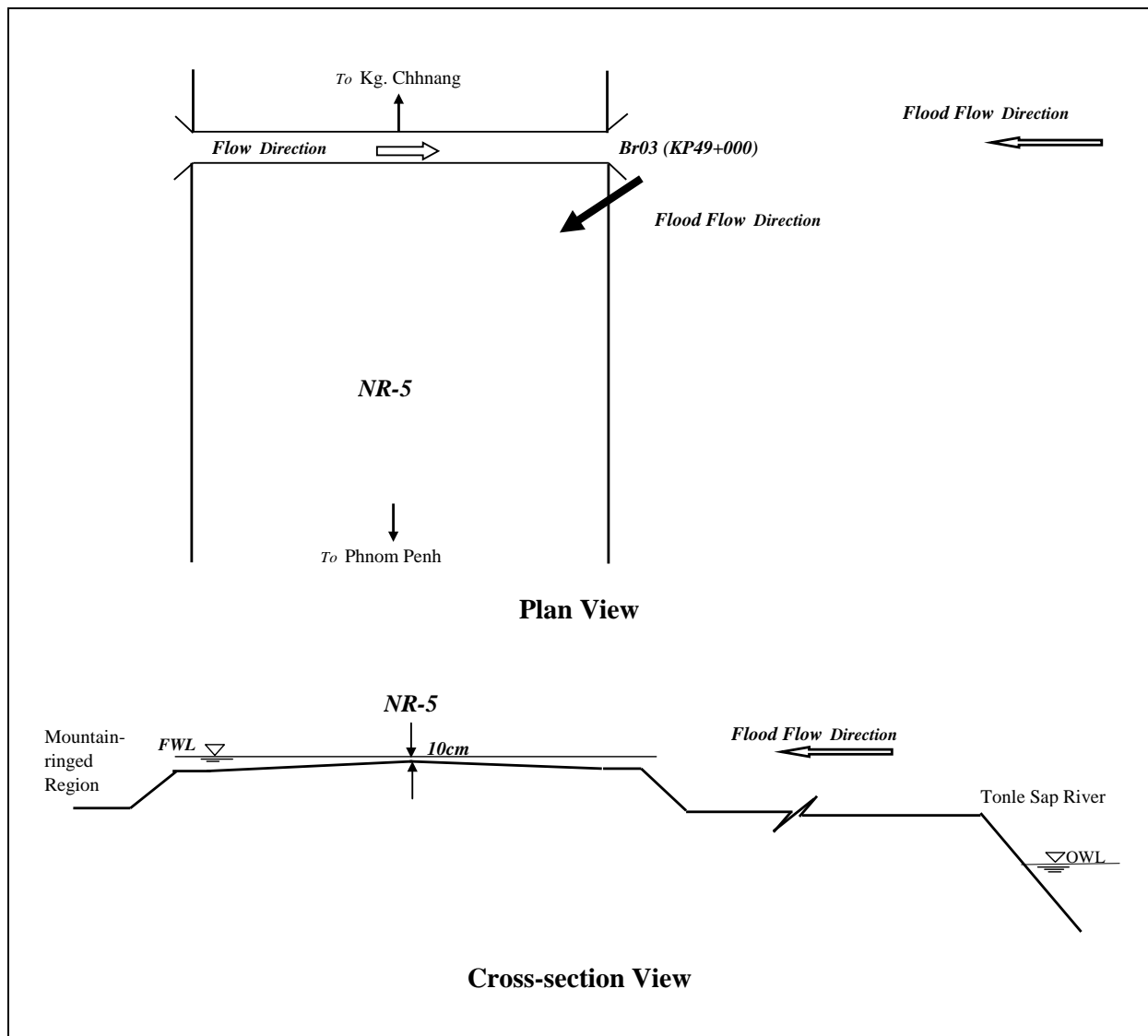
## Inventory Sheet on Information of Flooding Conditions

|                           |                              |                             |   |   |
|---------------------------|------------------------------|-----------------------------|---|---|
|                           |                              |                             | <b>No.:</b>                                 | 4 |
| <b>Date</b>               | 2 <sup>nd</sup> October 2012 |                             |   |   |
| <b>Interview with</b>     | Ms. Rich Samon, 48-years-old |                             |   |   |
| <b>PK (km)</b>            | 47+500                       | <b>Province</b>             | Kampong Chhnang                             |   |
| <b>Circumstance</b>       | Spean Pour Village           |                             |   |   |
| <b>Drainage Facility</b>  | None                         |                             |   |   |
| <b>Flood Level</b>        | 30 ~ 40cm                    | <b>Flood Flow Direction</b> | Tonle Sap River →<br>Mountain-ringed Region |   |
| <b>Frequency</b>          | Seldom                       |                             |   |   |
| <b>Duration Per Flood</b> | 3 ~ 4 days                   | <b>Occurrence Month</b>     | October 2011                                |   |



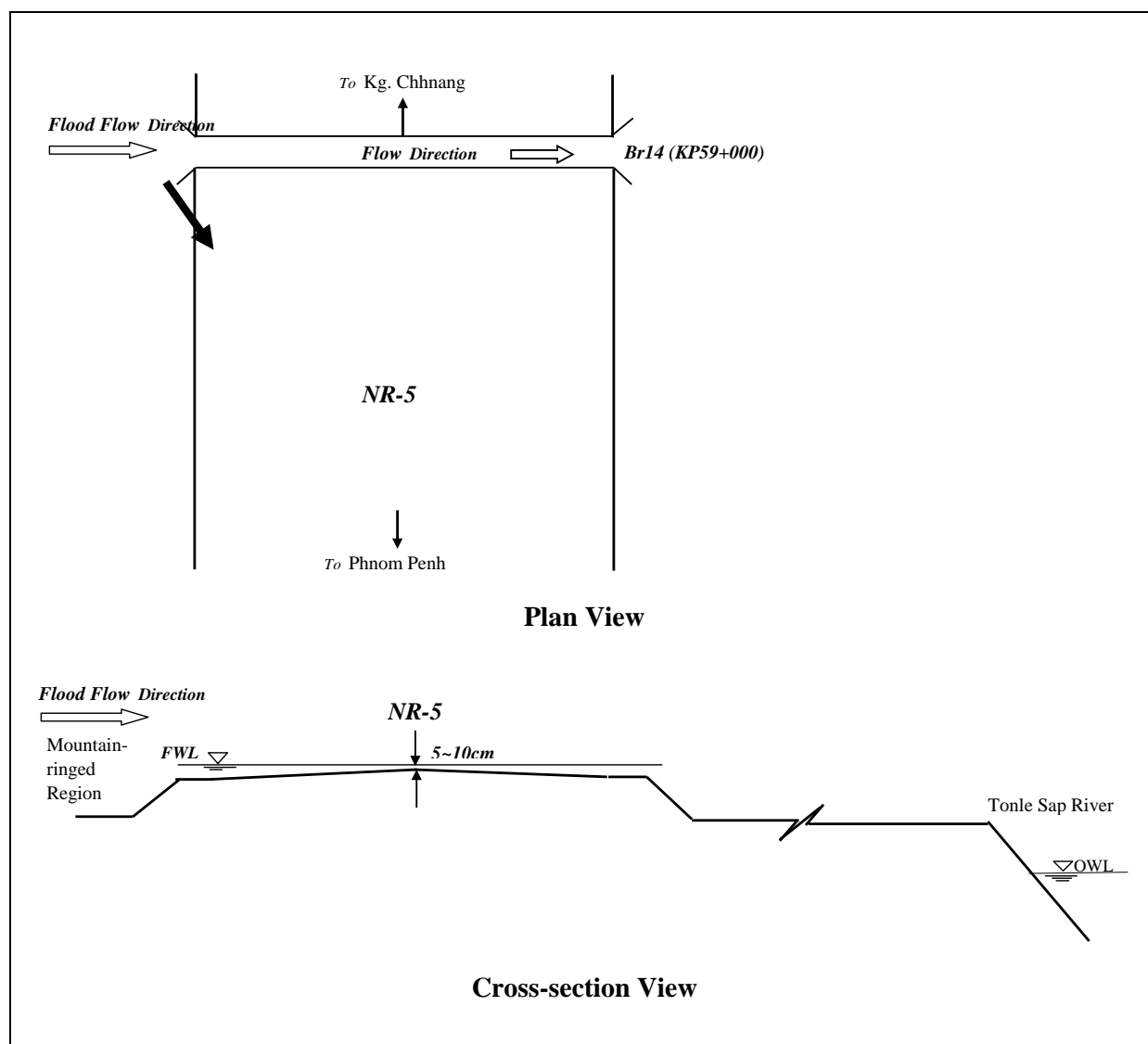
## Inventory Sheet on Information of Flooding Conditions

|                           |                              |                             |   |   |
|---------------------------|------------------------------|-----------------------------|---|---|
|                           |                              |                             | <b>No.:</b>                                 | 5 |
| <b>Date</b>               | 5 <sup>th</sup> October 2012 |                             |   |   |
| <b>Interview with</b>     | Ms. Jim Chenda, 52-years-old |                             |   |   |
| <b>PK (km)</b>            | 48+800                       | <b>Province</b>             | Kampong Chhnang                             |   |
| <b>Circumstance</b>       | Sethey commune               |                             |   |   |
| <b>Drainage Facility</b>  | None                         |                             |   |   |
| <b>Flood Level</b>        | 10cm                         | <b>Flood Flow Direction</b> | Tonle Sap River →<br>Mountain-ringed Region |   |
| <b>Frequency</b>          | Seldom                       |                             |   |   |
| <b>Duration Per Flood</b> | 3 ~ 4 days                   | <b>Occurrence Month</b>     | November 2011                               |   |



## Inventory Sheet on Information of Flooding Conditions

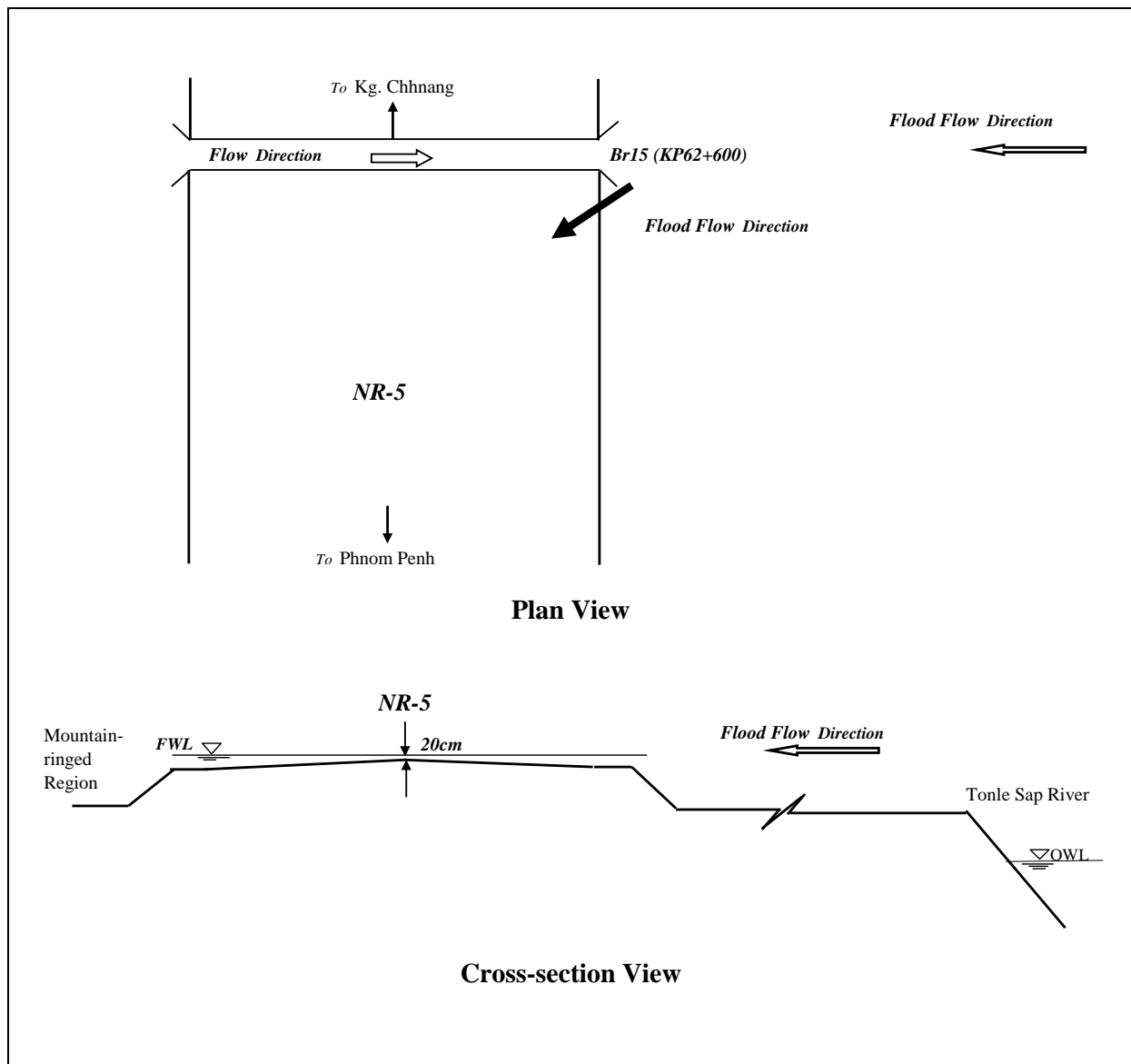
|                           |  |                             |   |   |
|---------------------------|--|-----------------------------|---|---|
|                           |  |                             | <b>No.:</b>                                 | 6 |
| <b>Date</b>               | 5 <sup>th</sup> October 2012             |                             |   |   |
| <b>Interview with</b>     | Mr. Lee Sman (House Owner), 46-years-old |                             |   |   |
| <b>PK (km)</b>            | 57+500                                   | <b>Province</b>             | Kampong Chhnang                             |   |
| <b>Circumstance</b>       | Prek Peas Village                        |                             |   |   |
| <b>Drainage Facility</b>  | None                                     |                             |   |   |
| <b>Flood Level</b>        | 5 ~ 10cm                                 | <b>Flood Flow Direction</b> | Mountain-ringed Region<br>→ Tonle Sap River |   |
| <b>Frequency</b>          | 1-yr (every year)                        |                             |   |   |
| <b>Duration Per Flood</b> | 12 hours                                 | <b>Occurrence Month</b>     | October 2011                                |   |





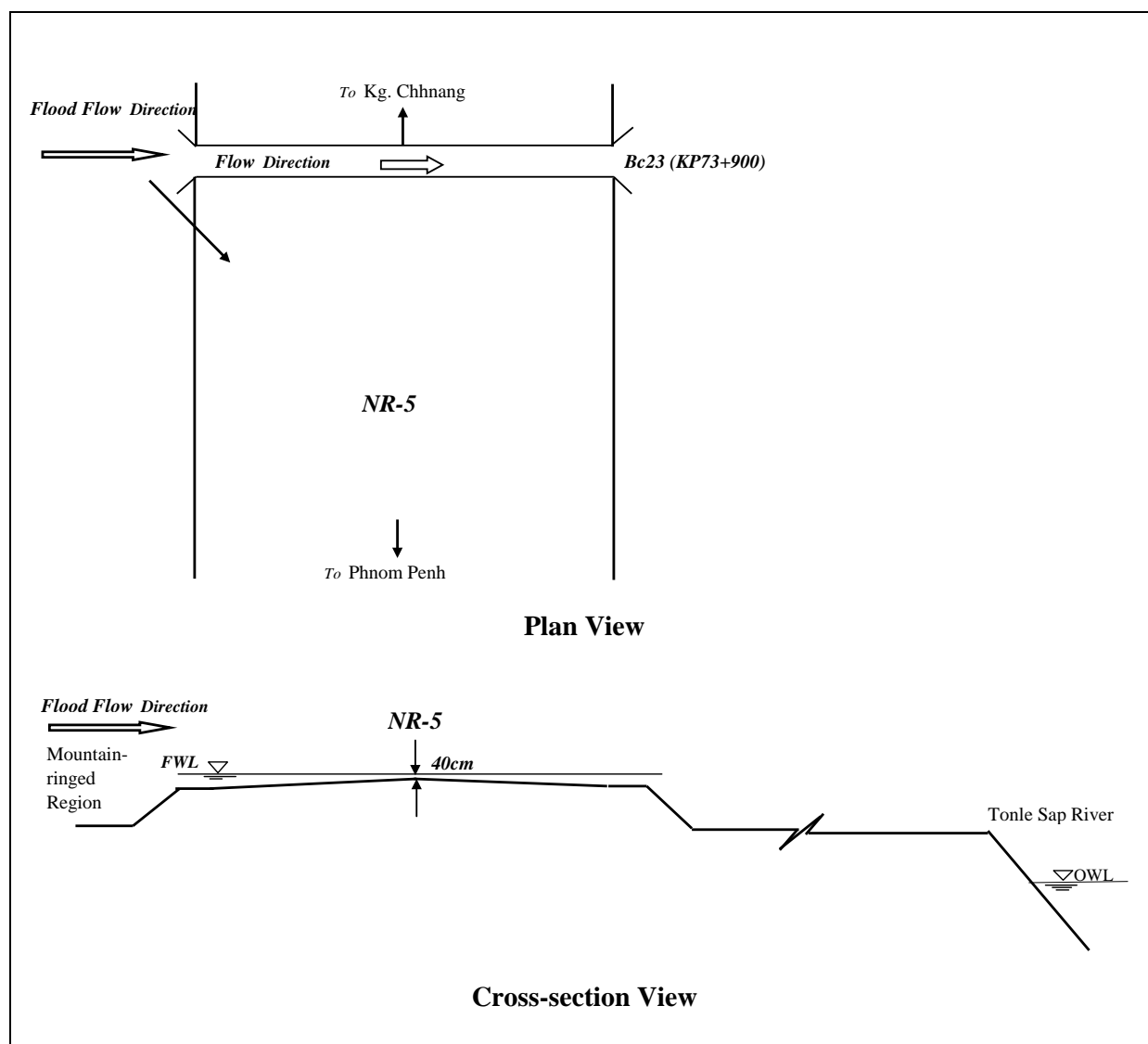
## Inventory Sheet on Information of Flooding Conditions

|                           |  |                             |   |   |
|---------------------------|--|-----------------------------|---|---|
|                           |  |                             | <b>No.:</b>                                 | 7 |
| <b>Date</b>               | 5 <sup>th</sup> October 2012             |                             |   |   |
| <b>Interview with</b>     | Mr. Math Min (House Owner), 55-years-old |                             |   |   |
| <b>PK (km)</b>            | 60+000                                   | <b>Province</b>             | Kampong Chhnang                             |   |
| <b>Circumstance</b>       | Chouk Sor Commune                        |                             |   |   |
| <b>Drainage Facility</b>  | Side Ditch (Both Sides)                  |                             |   |   |
| <b>Flood Level</b>        | 20cm                                     | <b>Flood Flow Direction</b> | Tonle Sap River →<br>Mountain-ringed Region |   |
| <b>Frequency</b>          | 1-yr (every year)                        |                             |   |   |
| <b>Duration Per Flood</b> | 2 ~ 3 days                               | <b>Occurrence Month</b>     | October 2011                                |   |



## Inventory Sheet on Information of Flooding Conditions

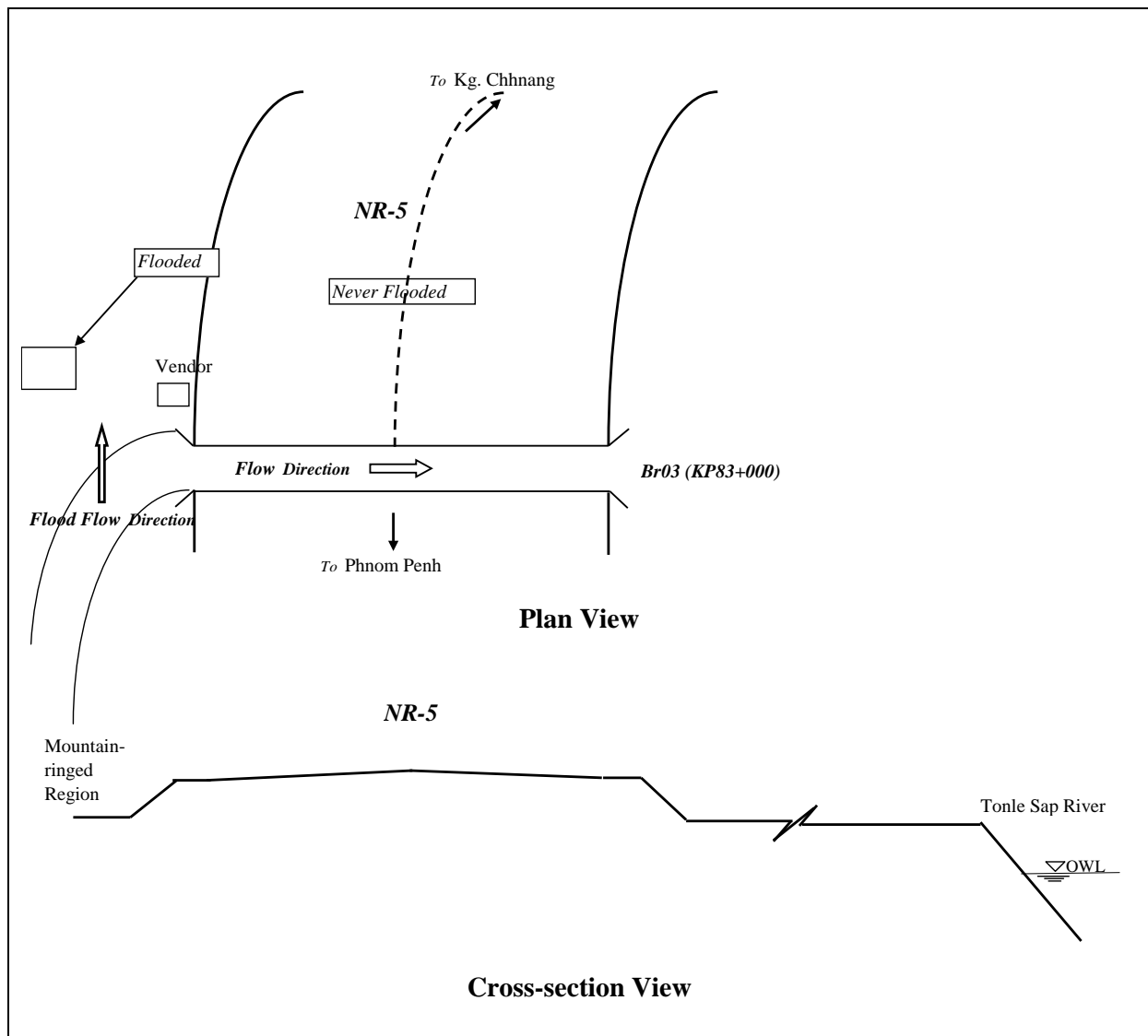
|                           |                               |                             |   |
|---------------------------|-------------------------------|-----------------------------|---|
|                           |                               | <b>No.:</b>                 | 8   |
| <b>Date</b>               | 5 <sup>th</sup> October 2012  |                             |   |
| <b>Interview with</b>     | Ms. Sok Chantha, 25-years-old |                             |   |
| <b>PK (km)</b>            | 73+000                        | <b>Province</b>             | Kampong Chhnang                             |
| <b>Circumstance</b>       | Teok Hot Commune              |                             |   |
| <b>Drainage Facility</b>  | Side Ditch (Both Sides)       |                             |   |
| <b>Flood Level</b>        | 40cm                          | <b>Flood Flow Direction</b> | Mountain-ringed Region<br>→ Tonle Sap River |
| <b>Frequency</b>          | Seldom                        |                             |   |
| <b>Duration Per Flood</b> | 1 week                        | <b>Occurrence Month</b>     | September ~ October<br>2010 & 2011          |



## Inventory Sheet on Information of Flooding Conditions

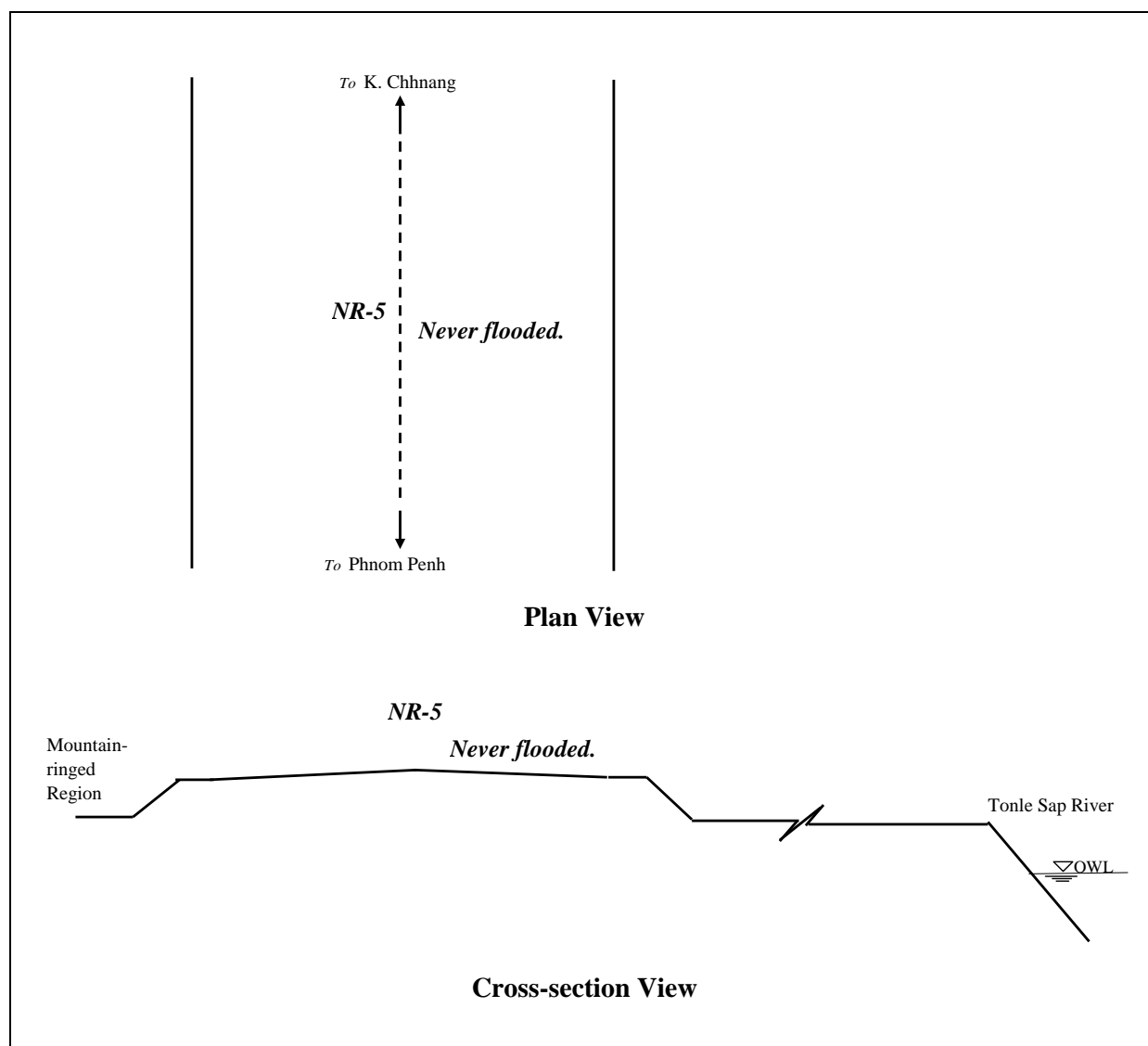
No.: 9

|                           |  |                             |   |
|---------------------------|--|-----------------------------|---|
| <b>Date</b>               | 5 <sup>th</sup> October 2012               |                             |   |
| <b>Interview with</b>     | Mrs. Qa Navy (House Owner), 19-years-old   |                             |   |
| <b>PK (km)</b>            | 83+000                                     | <b>Province</b>             | Kampong Chhnang                             |
| <b>Circumstance</b>       | Jrey Bak Commune                           |                             |   |
| <b>Drainage Facility</b>  | Drainage Canal (Both Sides)                |                             |   |
| <b>Flood Level</b>        | Never flooded<br>(30~40cm around<br>house) | <b>Flood Flow Direction</b> | Mountain-ringed Region<br>→ Tonle Sap River |
| <b>Frequency</b>          | Seldom                                     |                             |   |
| <b>Duration Per Flood</b> | 2 weeks                                    | <b>Occurrence Month</b>     | August – September 2011                     |



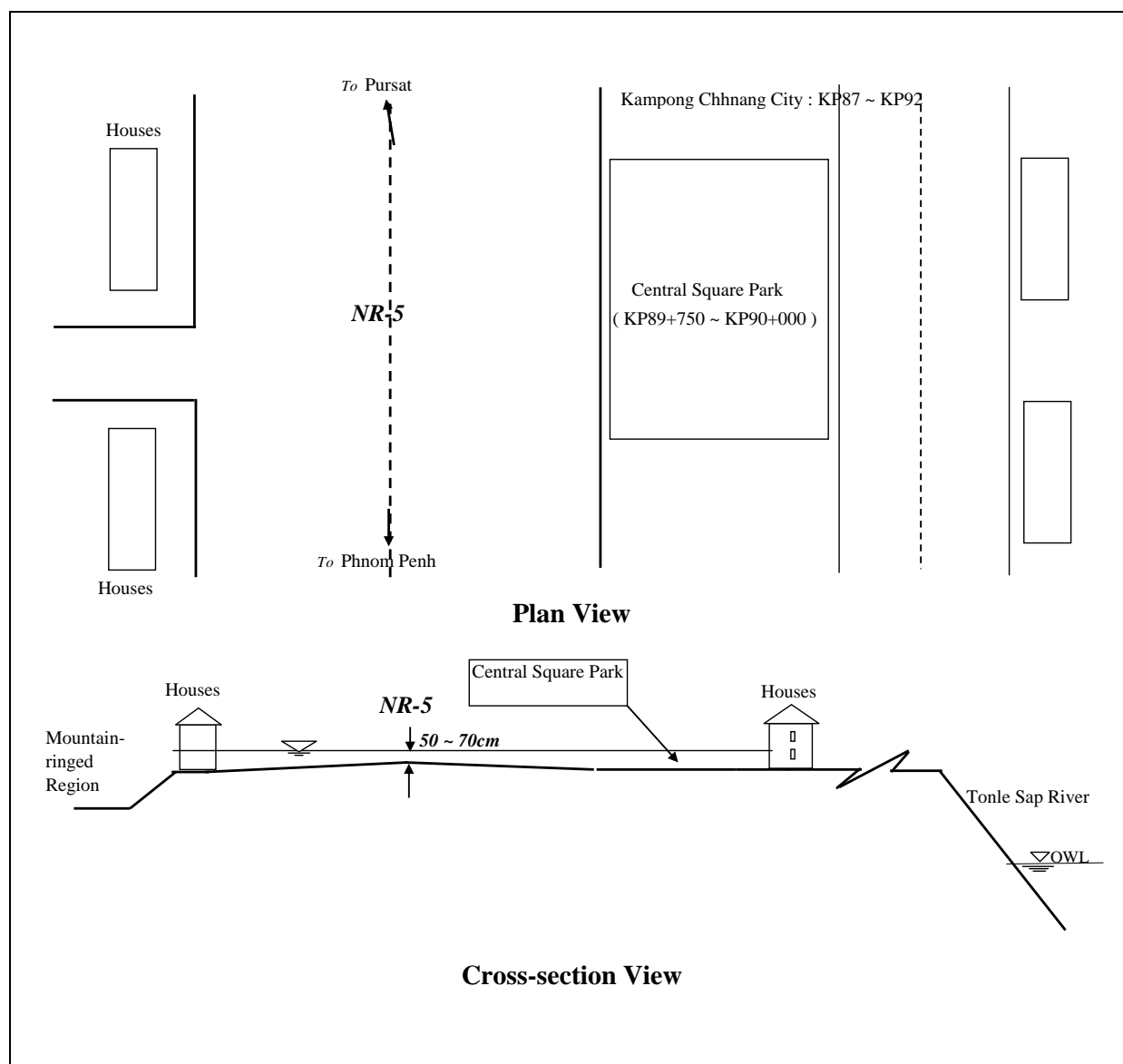
## Inventory Sheet on Information of Flooding Conditions

|                           |  |                         |                 |    |
|---------------------------|--|-------------------------|-----------------|----|
|                           |  |                         | <b>No.:</b>     | 10 |
| <b>Date</b>               | 5 <sup>th</sup> October 2012               |                         |                 |    |
| <b>Interview with</b>     | Ms. Nhean Soth (House Owner), 42-years-old |                         |                 |    |
| <b>PK (km)</b>            | 55+000                                     | <b>Province</b>         | Kampong Chhnang |    |
| <b>Circumstance</b>       | Sala Lekj Pram Commune                     |                         |                 |    |
| <b>Drainage Facility</b>  | None                                       |                         |                 |    |
| <b>Flood Level</b>        | Never flooded                              | <b>Flow Direction</b>   | Never flooded   |    |
| <b>Frequency</b>          | Never flooded                              |                         |                 |    |
| <b>Duration Per Flood</b> | Never flooded                              | <b>Occurrence Month</b> | Never flooded   |    |



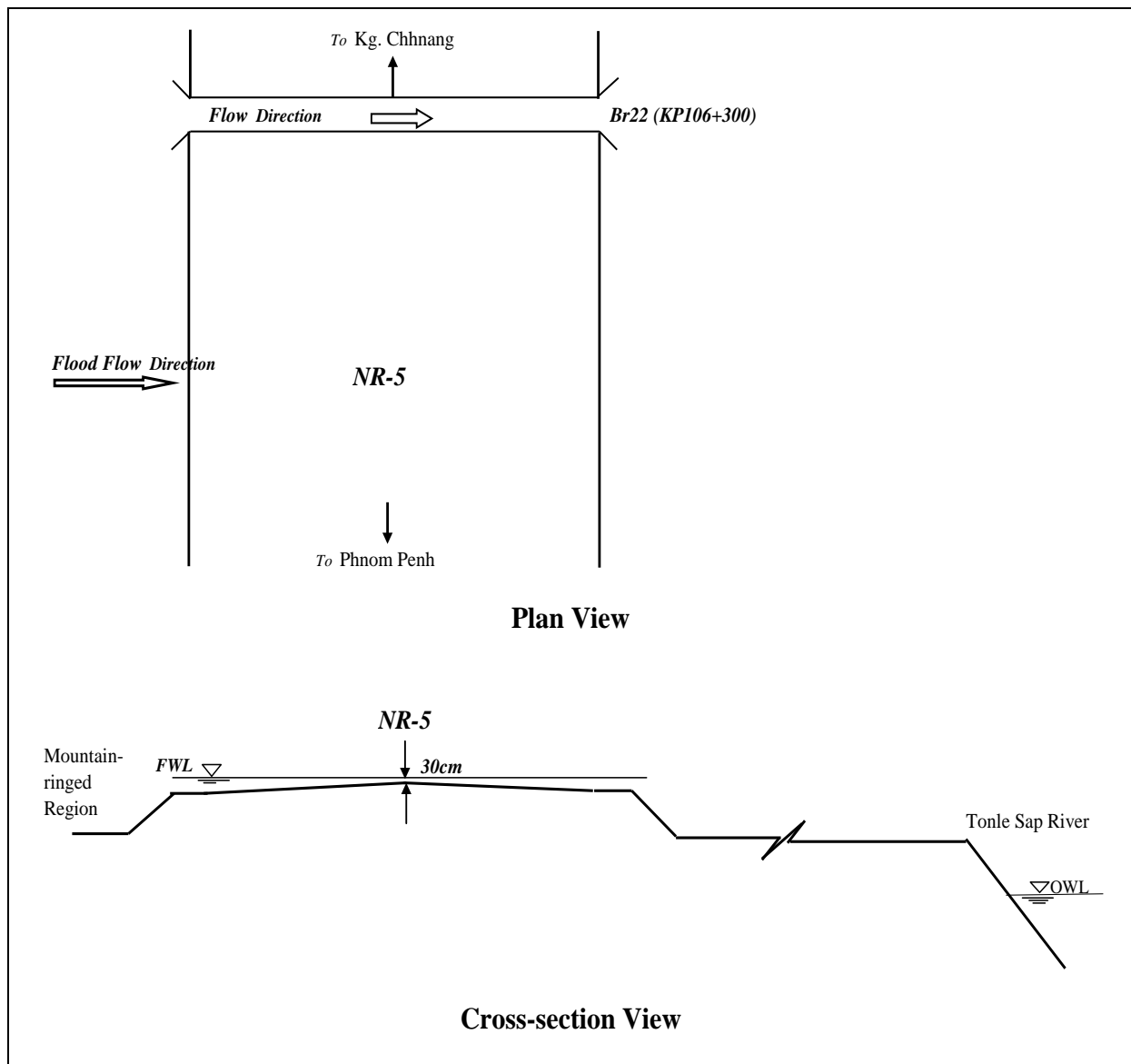
## Inventory Sheet on Information of Flooding Conditions

|                           |  |                         |                      |
|---------------------------|--|-------------------------|----------------------|
|                           |  | <b>No.:</b>             | 11                   |
| <b>Date</b>               | 10 <sup>th</sup> October 2012                    |                         |                      |
| <b>Interview with</b>     | Ms. Eung Sreng (Owner of Photoshop), 39-year-old |                         |                      |
| <b>PK (km)</b>            | 90+000   | <b>Province</b>         | Kampong Chhnang      |
| <b>Circumstance</b>       | City Square Park                                 |                         |                      |
| <b>Drainage Facility</b>  | None   |                         |                      |
| <b>Flood Level</b>        | 5 – 10 cm  | <b>Flow Direction</b>   | From Tonle Sap River |
| <b>Frequency</b>          | Seldom   |                         |                      |
| <b>Duration Per Flood</b> | 15 days  | <b>Occurrence Month</b> | September 2011       |



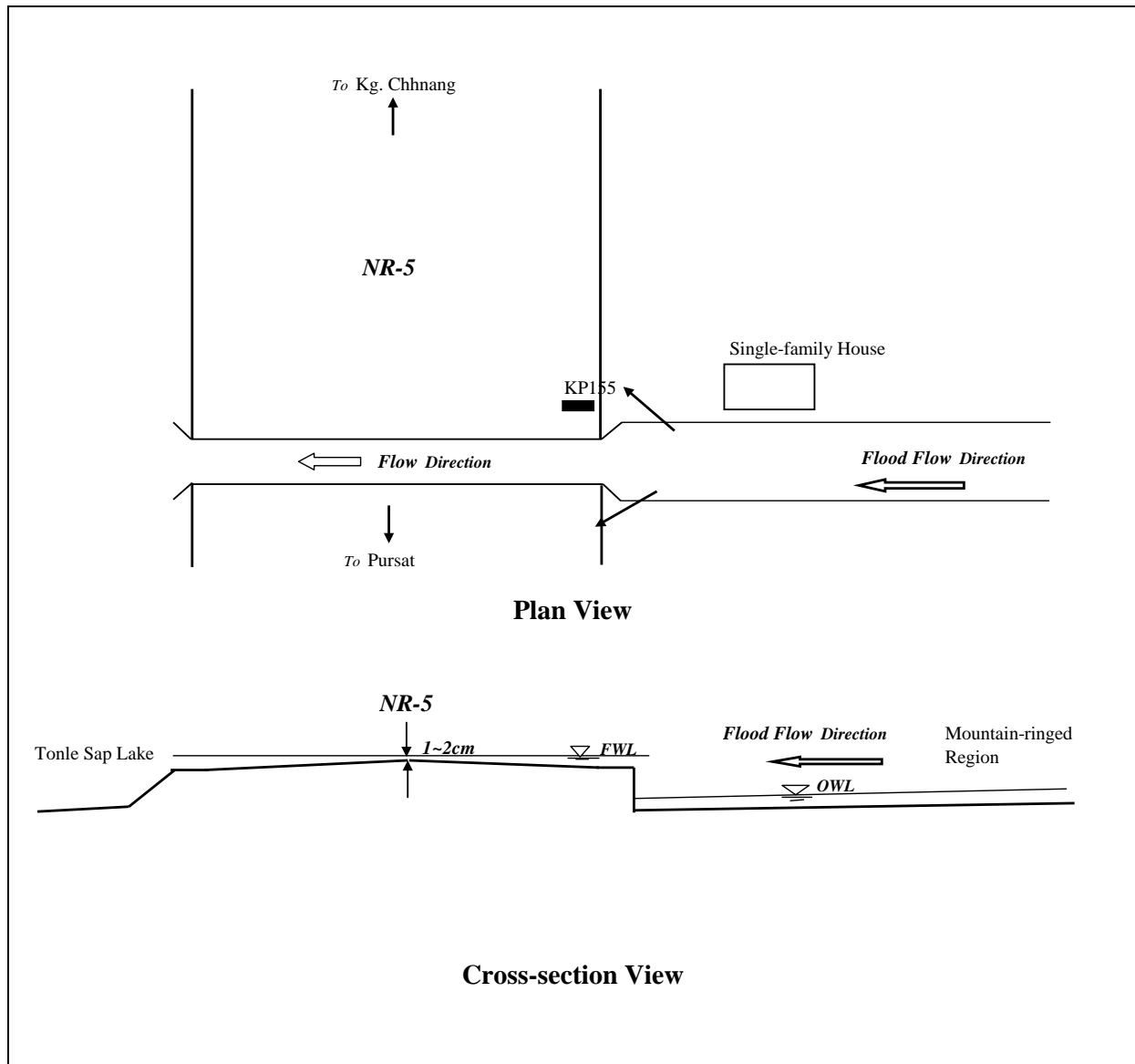
## Inventory Sheet on Information of Flooding Conditions

|                           |   |                         |   |
|---------------------------|---|-------------------------|---|
|                           |   | <b>No.:</b>             | 12  |
| <b>Date</b>               | 10 <sup>th</sup> October 2012                           |                         |   |
| <b>Interview with</b>     | Mr. Norg Phekday (Owner of Street Vender), 58-years-old |                         |   |
| <b>PK (km)</b>            | 106+100   | <b>Province</b>         | Kampong Chhnang                             |
| <b>Circumstance</b>       | Rural area  |                         |   |
| <b>Drainage Facility</b>  | None  |                         |   |
| <b>Flood Level</b>        | 30 cm   | <b>Flow Direction</b>   | Mountain-ringed Region<br>→ Tonle Sap River |
| <b>Frequency</b>          | Seldom  |                         |   |
| <b>Duration Per Flood</b> | 14 days   | <b>Occurrence Month</b> | September 2000                              |



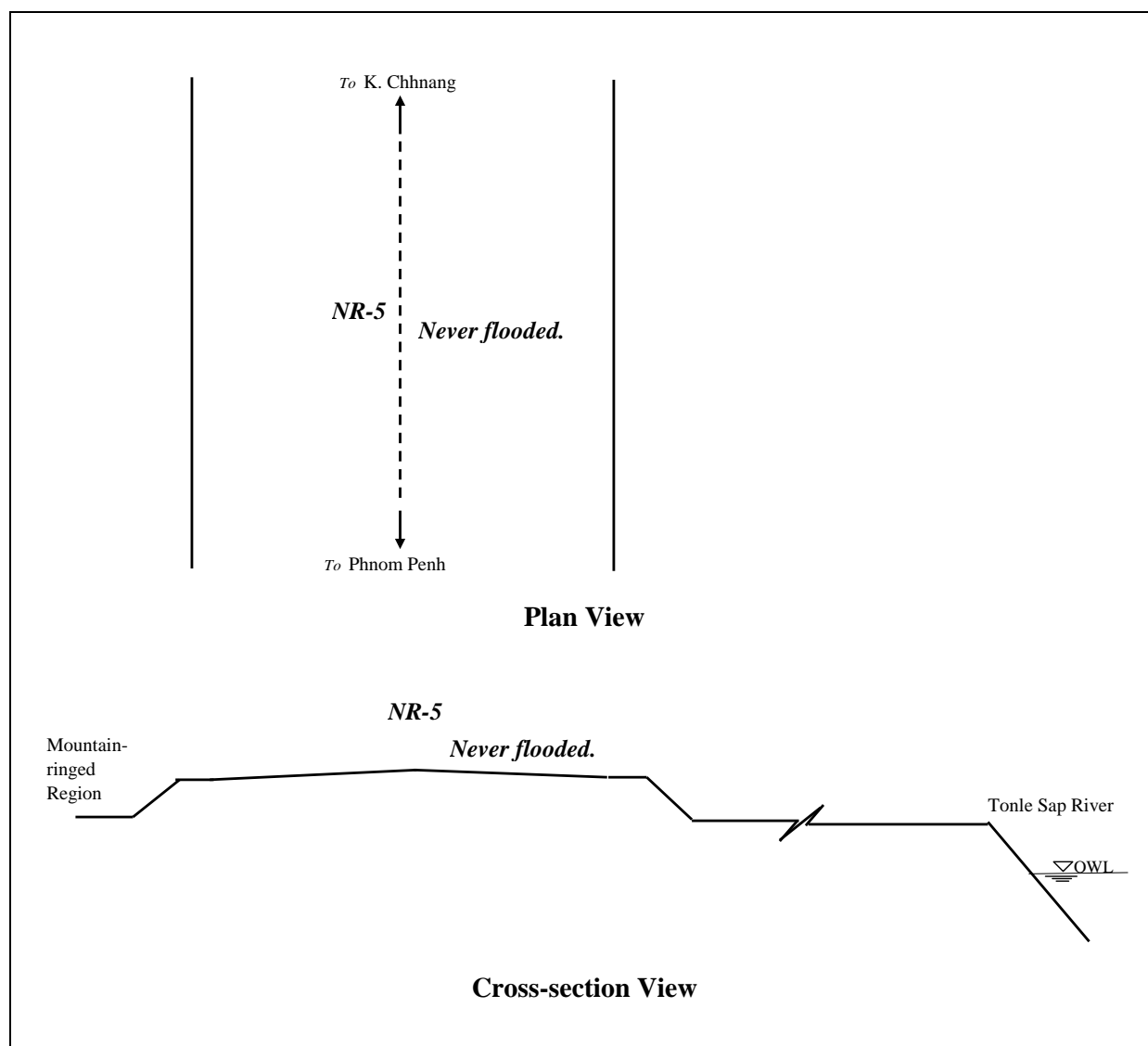
## Inventory Sheet on Information of Flooding Conditions

|                           |  |                         |  |    |
|---------------------------|--|-------------------------|--|----|
|                           |  |                         | <b>No.:</b>                                | 13 |
| <b>Date</b>               | 10 <sup>th</sup> October 2012          |                         |  |    |
| <b>Interview with</b>     | Mr. Nel Manrth (Teacher), 43-years-old |                         |  |    |
| <b>PK (km)</b>            | 155+000                                | <b>Province</b>         | Pursat                                     |    |
| <b>Circumstance</b>       | Krakor District (Suburban Area)        |                         |  |    |
| <b>Drainage Facility</b>  | Two pipe culverts                      |                         |  |    |
| <b>Flood Level</b>        | 1 -2 cm<br>(10 cm in 2000)             | <b>Flow Direction</b>   | Mountain-ringed Region<br>→ Tonle Sap Lake |    |
| <b>Frequency</b>          | N/A                                    |                         |  |    |
| <b>Duration Per Flood</b> | 2 – 3 days<br>(1 month in 2000)        | <b>Occurrence Month</b> | October 2010<br>(September 2000)           |    |



## Inventory Sheet on Information of Flooding Conditions

|                           |  |                         |                 |
|---------------------------|--|-------------------------|-----------------|
|                           |  | <b>No.:</b>             | 14              |
| <b>Date</b>               | 10 <sup>th</sup> October 2012                      |                         |                 |
| <b>Interview with</b>     | Ms. Sorthey (Owner of Street Vendor), 55-years-old |                         |                 |
| <b>PK (km)</b>            | 58+800   | <b>Province</b>         | Kampong Chhnang |
| <b>Circumstance</b>       | Odongk, Chhnk Sor                                  |                         |                 |
| <b>Drainage Facility</b>  | None   |                         |                 |
| <b>Flood Level</b>        | Never flooded                                      | <b>Flow Direction</b>   | Never flooded   |
| <b>Frequency</b>          | Never flooded                                      |                         |                 |
| <b>Duration Per Flood</b> | Never flooded                                      | <b>Occurrence Month</b> | Never flooded   |





## **APPENDIX 8-1**

### **POSSIBLE ROUTE OF ODONGK BYPASS**

**(This document was prepared for discussion on Odongk Bypass between MPWT, MEF and JICA Survey Team)**



## 1 Introduction

Widening of Odongk Section of NR 5 requires relocation of considerable number of houses/shops/buildings. Possibility of bypass construction was studied to avoid such relocation. In addition to reduction of relocation, construction of bypass gives the following benefits:

- (i) Smooth traffic: Vehicles can travel faster and smoother by not passing through the urbanized area of Odongk.
- (ii) Economic benefit: Smooth traffic yields economic benefits such as reduction of travel time and vehicle operation cost (fuel consumption etc).
- (iii) Reduction of traffic accidents, noise and air pollution: Through traffic will detour to the bypass resulting in reduction of traffic accident, noise and air pollution in the urbanized area.
- (iv) Sound development of the town: Smooth traffic allows sound economic growth of the town without problems which would be caused traffic congestion if through traffic would pass the urbanized area.

Because of these reasons, possibility of bypass construction around the urbanized area of Odongk was studied.

## 2 Initial Examination of Alternatives

Initially, several alternative routes as shown in the attached aerial photo (Figure-1) were examined. Advantages and disadvantages of these alternatives are compared in Table-1. Main points of consideration are explained below:

### (i) Historical heritage

One of the main concerns at this stage was historical heritage. Since the alternative routes traversing the southern side of the existing urbanized area pass near Phnom Odongk, old capital of Cambodia before Phnom Penh, high possibility of encountering historical heritage is considered to be high, compared to the alternatives traversing the northern side of the urbanized area.

Alternative-8 was planned to pass the southern area of Phnom Odongk to reduce the possibility of encountering historical heritage related to Phnom Odongk.

### (ii) Connection to NR 51

The alternative routes passing the southern side of Odongk Town are directly connected to NR 51 which extends to NR 4 in the west of Phnom Penh. Thus these alternatives will contribute to smooth transportation route of Thai border – Battambang - NR 51 - NR 4 – Sihanouk Ville without passing through congested Phnom Penh and its suburbs. Thus, these alternatives are very preferable from view point of nation-wide transport.

(iii) Flood

During the flood season, the area surrounding Odongk Town is flooded. Construction of highway embankment in flooded area need certain consideration in highway design, such as slope protection and soft ground treatment, some additional construction cost and adjustment of execution schedule of civil works. Thus, the length of section to be constructed in the flooded area should be as short as possible.

(iv) Initial Screening

After the above evaluation and comparison, Alt-1, Alt-2 and Alt-8 were discarded for the following reasons:

- Alt-1 and Alt-2 were evaluated to be less attractive than other alternative routes (have no particular advantages) and were discarded.
- Further examination of Alt-4 was temporarily halted because it is too close to the existing urbanized area. Thus the road side of this route will be urbanized soon and the function as a bypass will be substantially lost.
- Alt-8 was found to have the following serious disadvantages and discarded:
  - Length of the bypass becomes excessively long (13.9km).
  - Location of southern connection point with the existing NR 5 becomes south of Prek Kdam Bridge where the NR 5 is being widened under Chinese financial assistance.

### 3 Further Examination of Alternatives

(i) Modification of Alternatives

As the result of the initial examination and screening as stated above, three alternatives (Alt-3, Alt-5 and Alt-6) remained. The Survey Team had discussion with MPWT in early January 2013 on these possible routes after preliminary observation of site conditions. MPWT's comments on these routes are as follows:

- Alt-3: Large-scale development is on-going at the west connection point of the bypass and the existing NR 5. Thus, the connection point needs to be shifted to south by about 1km.
- Large-scale development is to be started in the area around the east connection points of Alt-7 with NR 5. Thus, land acquisition is very difficult.

Based on the discussion with MPWT and further observation of the site conditions, three alternatives were modified as shown in Figure-2:

- Alt-3a: The west connection point of Alt-3 is shifted to south by about 1km to avoid

the development project site.

- Alt-7a: This alternative is planned as the reserve route to be considered if existence of historical heritage is suspected on the route of Alt-7.
- Alt-7b: This alternative is planned to avoid crossing with the road going to Phnom Odongk where high possibility of encountering historical heritage is anticipated.

(ii) Survey on Site Conditions

The Survey Team surveyed the site conditions in January – February 2013 mainly focusing on the route of Alt-3a and found the following problems:

- There are many concrete piles in the area around the east connection point of the bypass and NR 5, indicating a development project has started and land acquisition is difficult.
- Land fill (embankment) has been done in the vicinity of the west connection point indicating land acquisition may be difficult.

(iii) Consultation with Ministry of Culture and Fine Art and

Since the bypass is to traverse the area where existence of historical heritage is highly possible, the Survey Team visited the Ministry of Culture and Fine Art (MCFA) on 24 January 2013 to consult on survey on historical heritage.

MCFA's comments were basically as follows:

- Staff of MCFA will join MPWT staff in the survey for identifying existence of historical heritage.
- If historical heritage is found on the route of bypass (or NR 5), survey is conducted and conditions of the heritage site is recorded. The cultural remains (such as ceramics) are stored or displayed in museum. After survey, road can be constructed.
- In the north of Odongk Town, a historical site of Longvaek exists. Experts of Nara National Research Institute for Cultural Properties (of Japan) are cooperating with MCFA in survey and restoration of historic sites in Cambodia, including Angkor Watt. They are now surveying the site of Longvaek.

Based on the above comments of MCFA, the Survey Team contacted the experts of Nara National Research Institute for Cultural Properties and asked their opinion on the bypass routes. They explained that the survey on Longvaek has just started and very little is known at present. Based on the results of the survey so far done, their comments are as summarized below:

- While there is high possibility of existence of historical heritage in the south of Odongk Town, there are also historical heritage sites in the north of the town,

between Longvaek and the town.

- Three old roads used during the period of Longvaek Capital are still remaining (Figure-3). These old roads need to be maintained.
- However, the bypass can be constructed on the north side of Odongk Town if diligent consideration is given to maintain the historical heritage and survey is conducted before construction of the bypass.

#### (iv) Evaluation of Alternative Routes

Based on the information described above, the each alternative route is evaluated as summarized below:

- Alt-3a (Alt-3): Private development projects are going on around or near the connection points to NR 5. Thus, the locations of both connection points need to be changed.
- Alt-7 and Alt-7a: Large-scale private development project has started around the east connection point with NR 5, according to MPWT, and acquisition here is difficult. Thus, these alternatives are not recommended.
- Alt-5 and Alt-7b: Length of bypass is considerably longer than the length of the existing NR 5r corresponding to the bypass, and traffic is not expected to divert to bypass. Thus, these alternatives are not recommended.

As a conclusion, only Alt-3a can be recommended but needs substantial modification of alignment to move both of the connection points with the existing NR 5.

## 4 Modification of Alt-3a Route and Proposed Bypass Route

### (i) Proposed Route

Survey Team surveyed the site condition again to identify the possible connection points of bypass with existing NR 5. The route of Alt-3a is largely modified so that the bypass can be connected to NR 5 without difficulty of land acquisition. Two routes as shown in Figure-3 are proposed.

The main points of planning of these routes are summarized below:

Table-3 Main Points of Planning of Route

|                                   |   |
|-----------------------------------|---|
| Location of East Connection Point | Outside of densely populated section                              |
| Location of East Connection Point | Place where no development project started at present             |
| Alignment                         | Minimize impact to cultural heritages in the north of Odongk Town |

Route-1 is recommended as the first priority because of its smoother horizontal alignment and shortening of travel distance, although only 0.2km (bypass=4.9km; NR 5=5.1km). Route-2 is proposed as the reserve plan because there are grave yards

(tombs) close to the east connection point of Rout-1. If it will be found that relocation of tombs be necessary and such relocation be difficult, Rout-2 shall be adopted.

(ii) Preliminary Estimation of Construction Cost

Very preliminary estimation of construction const is summarized below:

Table-4 Preliminary Cost Estimation

| (US\$ million) |                     |                  |            |
|----------------|---------------------|------------------|------------|
| Route          | Bypass Construction | Widening of NR 5 | Difference |
| Route-1        | 5.77                | 5.43             | +0.34      |
| Route-2        | 5.47                | 4.86             | +0.61      |

Increase of construction cost for bypass, compared to widening of the existing NR 5 is larger in Route-2 because Route-2 is longer than corresponding section of the existing NR 5 while Route-1 is shorter than the existing NR 5.

The main reason of small differences is that if the existing NR 5 is to be widened, 2.5m-side parking spaces are needed on the both sides while such parking spaces are not necessary in bypass. A large portion of the construction cost is the cost for pavement. Thus, seining of existing NR 5 in urbanized area needs large cost and pavement cost of bypass is smaller than pavement cost of widening of existing NR 5.

Please note that the above construction costs do not include the cost for land acquisition/relocation.

5 Conclusion

Route-1 as shown in Figure-3 is recommended as the optimum route of Odnkg Bypass.

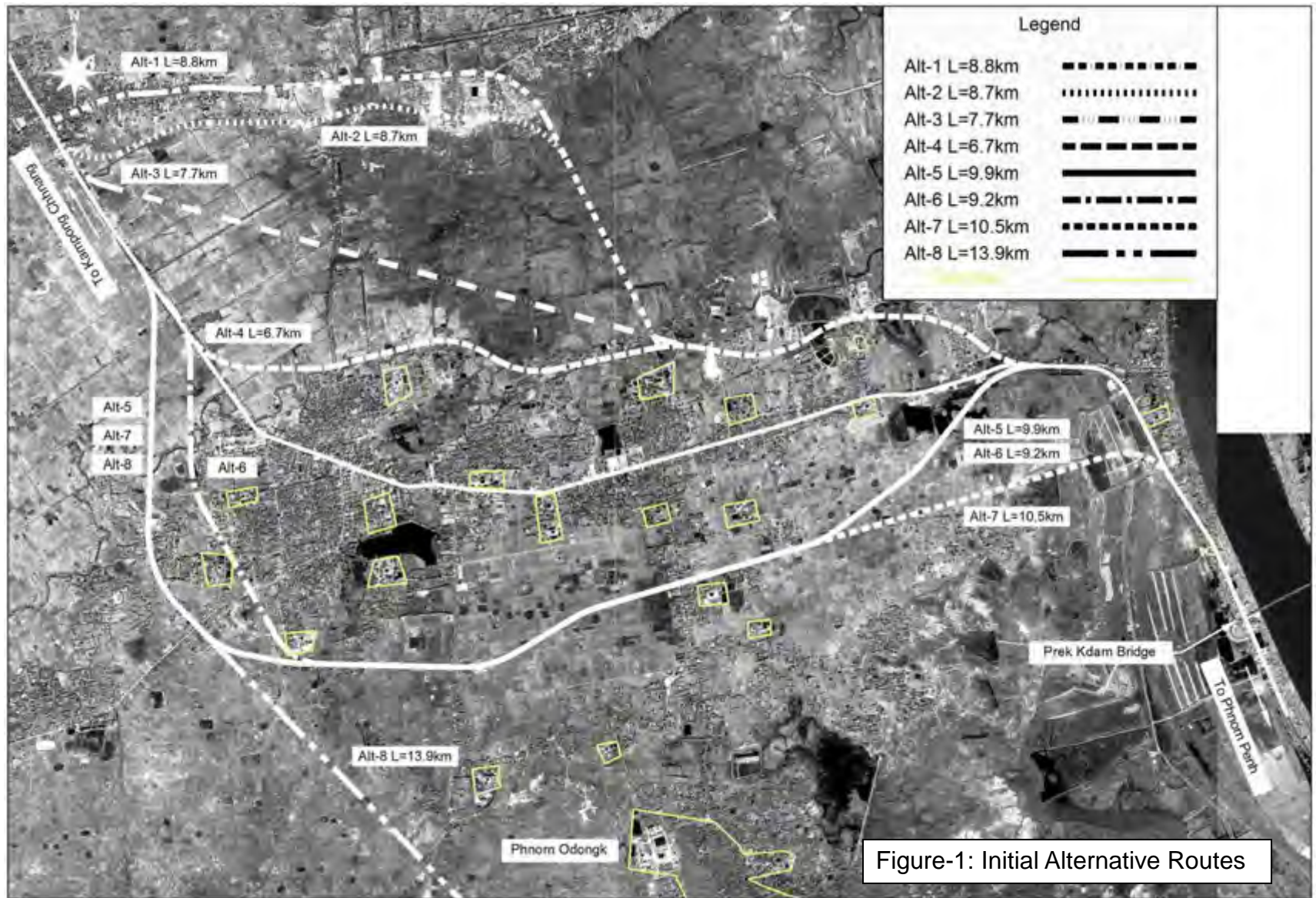


Figure-1: Initial Alternative Routes



Table-1: Comparison of Alternative Routes in Initial Examination

| Alternative          |       | Traffic/Road Function   | Length (km) | Land Acquisition/Relocation                               | Historical Heritage  | Others  |
|----------------------|-------|---|-------------|---|--|---|
| North of Odongk Town | Alt-1 | • North end section passes through town of Phsar Trach. Thus function as bypass is reduced. (D)   | 8.8         | • Considerable number of houses need to be relocated. (D) | • Away from Phnom Odongk (A)   | • Considerable section needs to be constructed in flooded area (D)  |
|                      | Alt-2 | • Does not pass urbanized area. (A)<br>• Horizontal alignment is not smooth.  | 8.7         | • Large scale relocation is not required.                 |  |   |
|                      | Alt-3 | • Does not pass urbanized area. (A)<br>• Travel distance becomes shorter compared with the existing NR 5. (A)   | 7.7         |   |  | • Almost entire section needs to be constructed in flooded area (D) |
|                      | Alt-4 | • Pass hemisphere of urbanized area. Road side area will be urbanized & function of bypass will be reduced in near future.<br>• Horizontal alignment is not smooth.   | 6.7         |   |  |   |
| South of Odongk T.   | Alt-6 | • Direct connection to NR 51 (A)<br>• Passes west hemisphere of urbanized area. Road side area will be urbanized & function of bypass will be reduced in near future.<br>• Travel distance becomes longer than existing NR 5. (D) | 9.2         | • Large scale relocation is not required.                 | • High possibility of encountering historical heritage due to closeness to Phnom Odongk. (D) |   |
|                      | Alt-7 | • Direct connection to NR 51 (A)  | 10.5        |   |  | • About 2km-long section is constructed in flooded area (D)         |
|                      | Alt-8 | Direct connection to NR 51 (A)  | 13.9        |   |  | • Lower possibility of encountering historical heritage             |

D: Disadvantage (substantial) A: Advantage (substantial)

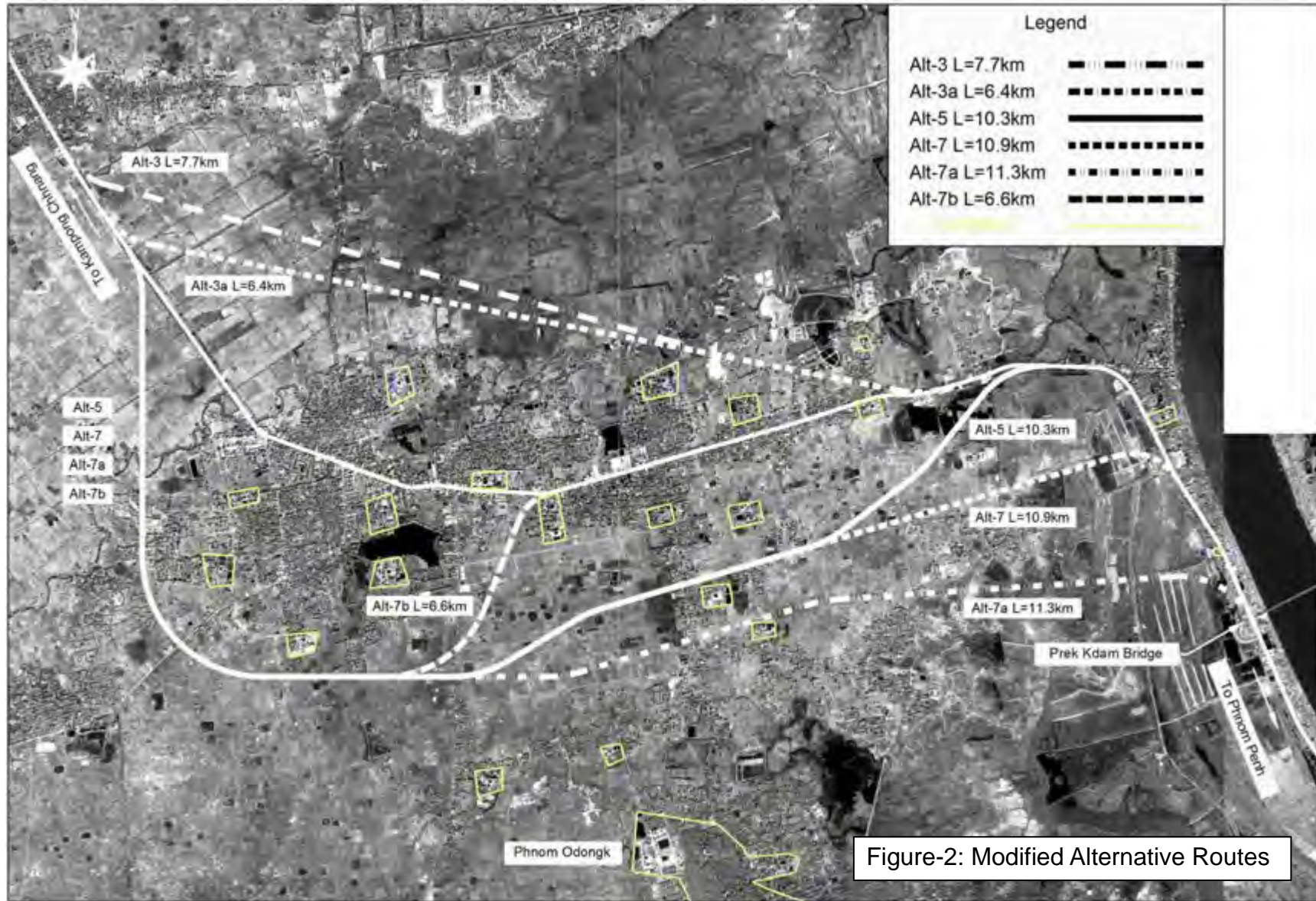


Figure-2: Modified Alternative Routes

Table-2 Further Examination of Alternative Route

| Alternative | Traffic/Road Function | Length (km)   | Land Acquisition | Historical Heritage   | Others  |   |
|-------------|-----------------------|---|------------------|---|---|---|
| North       | Alt-3                 | Changed to Alt-3a considering private development project around the west connection point with NR 5.   |                  |   |   |   |
|             | Alt-3a                | <ul style="list-style-type: none"> <li>Does not pass urbanized area. (A)</li> <li>Travel distance becomes shorter compared with the existing NR 5. (A)</li> </ul> | 6.4              | <ul style="list-style-type: none"> <li>Large scale relocation is not required.</li> </ul> | <ul style="list-style-type: none"> <li>Crosses 2 ancient roads</li> </ul>   | <ul style="list-style-type: none"> <li>Large portion of the entire section needs to be constructed in flooded area.</li> </ul>                          |
| South       | Alt-5                 | Direct connection to NR 51 (A)  | 10.3             | <ul style="list-style-type: none"> <li>Large scale relocation is not required.</li> </ul> | <ul style="list-style-type: none"> <li>High possibility of encountering historical heritage but no concrete data/information at present. (D)</li> </ul> |   |
|             | Alt-7                 | Travel distance becomes longer:   | 10.9             | Private development project has started at the east end. (D)                              |   | <ul style="list-style-type: none"> <li>About 2km-long section needs to be constructed in flooded area.</li> </ul>                                       |
|             | Alt-7a                | Alt-5: 2.5km<br>Alt-7: 1.7km  | 11.3             |   |   | <ul style="list-style-type: none"> <li>Substantial section needs to be constructed in flooded area (D)</li> </ul>                                       |
|             | Alt-7b                | Alt-7a: 0.9km<br>Alt-7b: 2.6km (D)  | 6.6              | <ul style="list-style-type: none"> <li>Large scale relocation is not required.</li> </ul> |   | <ul style="list-style-type: none"> <li>Possibility of encountering historical heritage is low compared with Alt-5, Alt-7, Alt-7a and Alt-7b.</li> </ul> |

D: Disadvantage (substantial) A: Advantage (substantial)

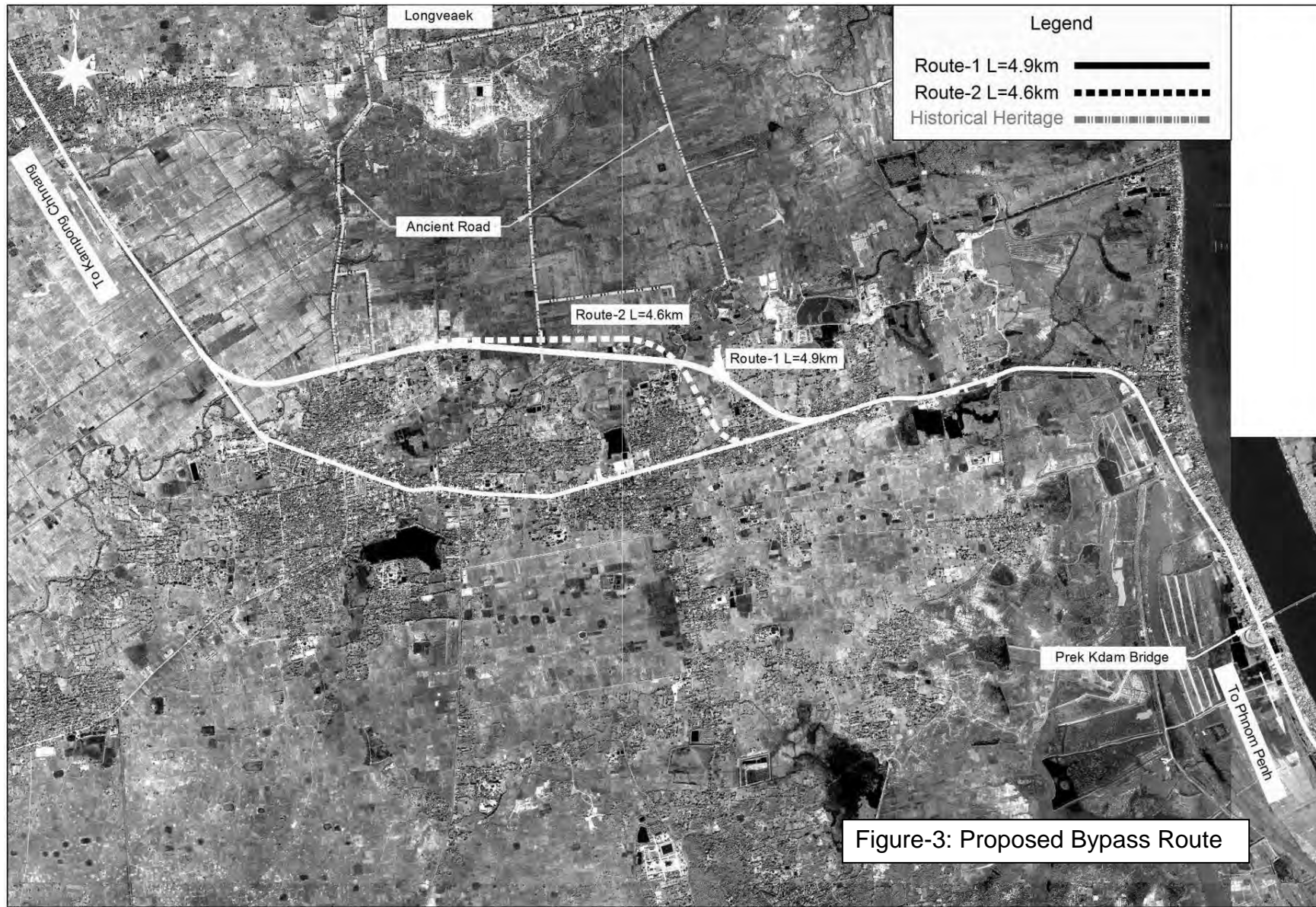


Figure-3: Proposed Bypass Route

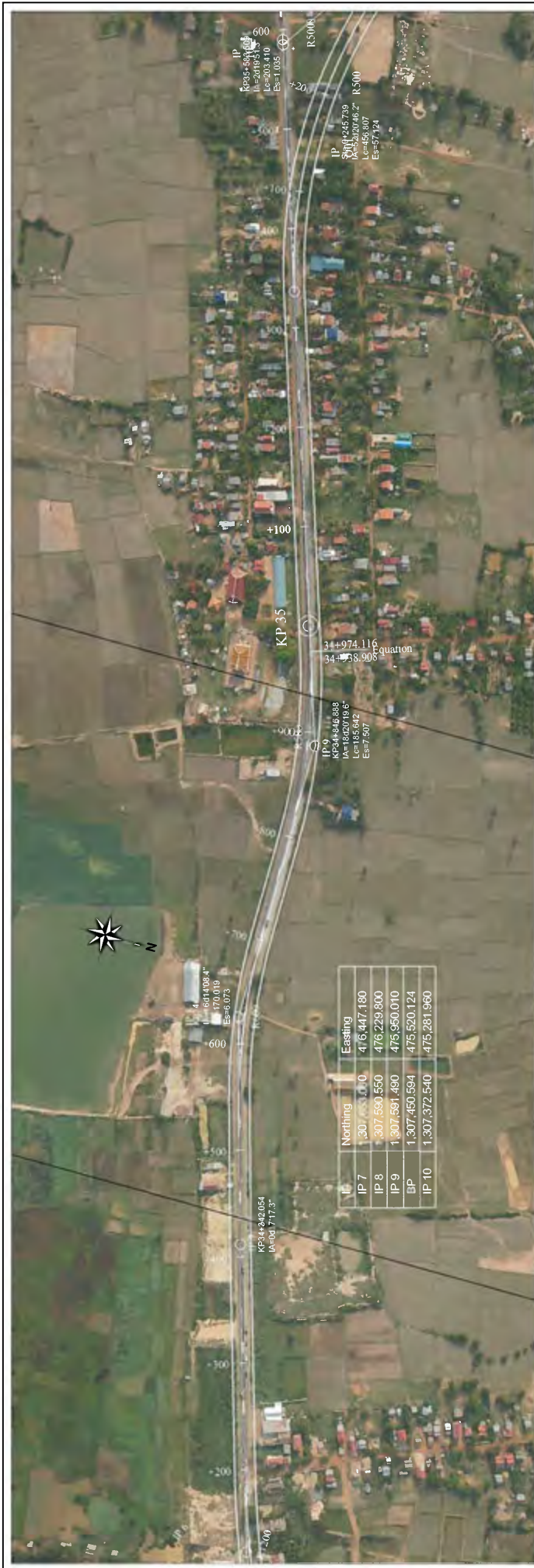
## **APPENDIX 9-1**

# **KEY PLAN OF NATIONAL ROAD NO.5 IN THE SOUTH SECTION**



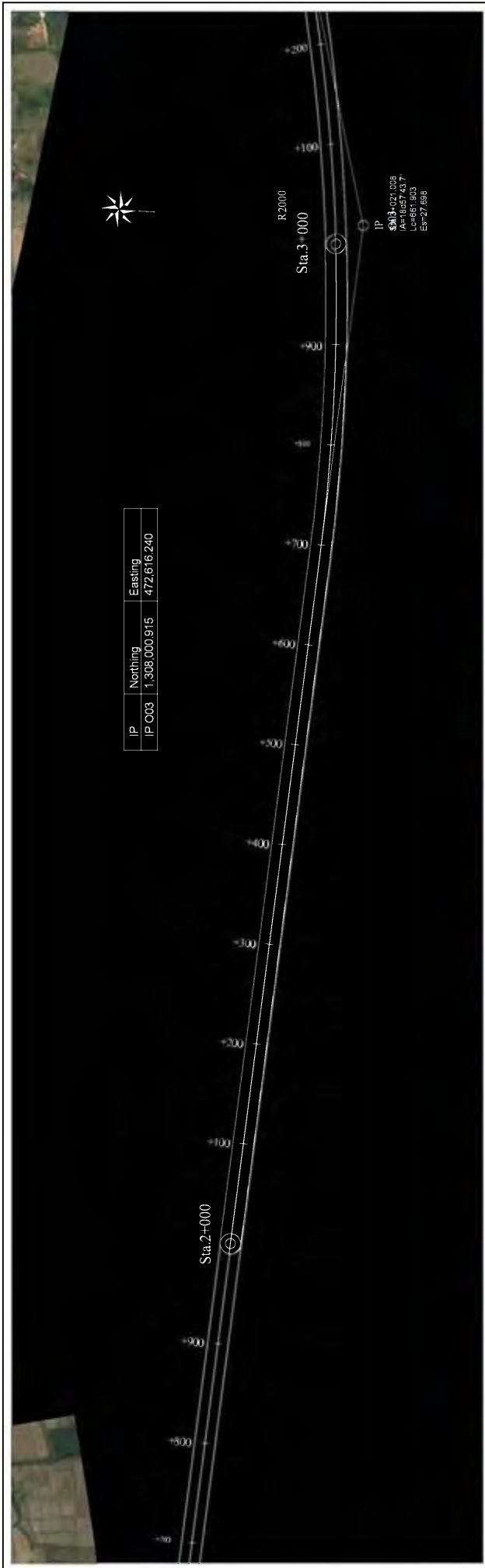


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|---|---|---|--|
| <br><b>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT</b><br>KINGDOM OF CAMBODIA | <b>JAPAN INTERNATIONAL COOPERATION AGENCY</b><br>KATAHIRA & ENGINEERS INTERNATIONAL | <b>TITLE :</b><br>PREPARATORY SURVEY FOR NATIONAL<br>ROAD NO.5 (SOUTH SECTION)<br>IMPROVEMENT PROJECT | <b>Drawing No.:</b> KP - 1               |
|   |   |   | <b>Scale:</b> A1: 1/2,000<br>A3: 1/4,000 |
|   |   |   | <b>Date:</b> AUG. 2013                   |



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|   |  |  |  | Scale: <b>1:12,000</b>    |





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|  |   | <p><b>KEY PLAN</b></p> <p><b>(Sta. 1+700~Sta.4+600)</b></p>   | <p><b>Scale</b></p> <p>A1: 1/2,000<br/>A3: 1/4,000</p> |
|  |   |   | <p><b>Date</b></p> <p>AUG. 2013</p>                    |



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|  | <p><b>Scale:</b> A1: 1/2,000<br/>A3: 1/4,000</p>  | <p><b>Date:</b> AUG. 2013</p>  |   |                                   |



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TITLE : **KEY PLAN**  
 (KP42+700~KP45+600)

Drawing No: **KP - 5**  
 Scale: A1: 1/2,000  
 A3: 1/4,000  
 Date: **AUG. 2013**



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|  |  |   |   | scale<br>A1: 1/2,000<br>A3: 1/4,000 |
|  |  |   | Date : <b>AUG. 2013</b>                               |                                     |



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IMPROVEMENT PROJECT

TITLE: **KEY PLAN**  
**(KP48+600~KP51+500)**

Drawing No: **KP - 7**  
Scale: A1: 1/2,000  
A3: 1/4,000  
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TITLE : **KEY PLAN**  
**(KP51+500~KP54+400)**

|             |                            |
|-------------|----------------------------|
| Drawing No. | KP - 8                     |
| Scale       | A1: 1/2,000<br>A3: 1/4,000 |
| Date        | AUG. 2013                  |



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IMPROVEMENT PROJECT

KEY PLAN  
(KP57+400~KP60+400)

Drawing No. KP - 10  
Scale A1: 1/2,000  
A3: 1/4,000  
Date: AUG. 2013







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**Drawing No:** KP - 11

**Scale:** A1: 1/2,000  
A3: 1/4,000

**Date:** AUG. 2013



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IMPROVEMENT PROJECT

TITLE : **KEY PLAN**  
**(KP63+300~KP66+300)**

Drawing No: **KP - 12**  
Scale: A1: 1/2,000  
A3: 1/4,000  
Date: **AUG. 2013**



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|   |   |   | <b>Scale</b> A1: 1/2,000<br>A3: 1/4,000 |
|   |   |   | <b>Date.</b> AUG. 2013                  |



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IMPROVEMENT PROJECT

TITLE : **KEY PLAN**  
**(KP72+100~KP75+100)**

Drawing No. **KP - 15**  
Scale: A1: 1/2,000  
A3: 1/4,000  
Date: **AUG. 2013**



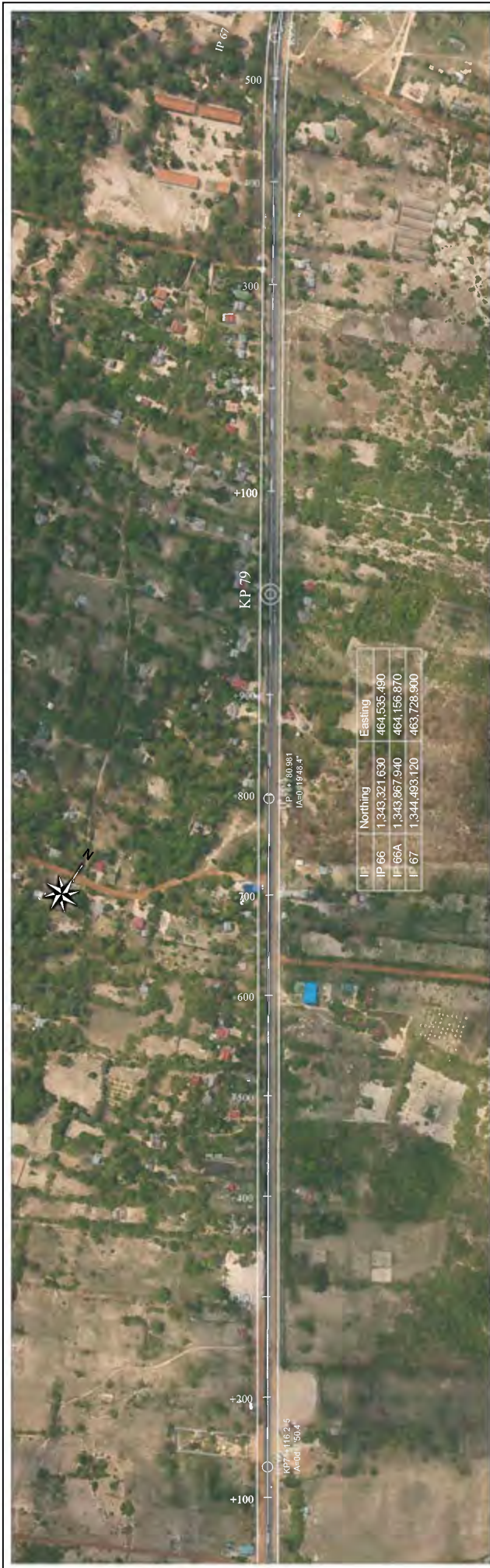
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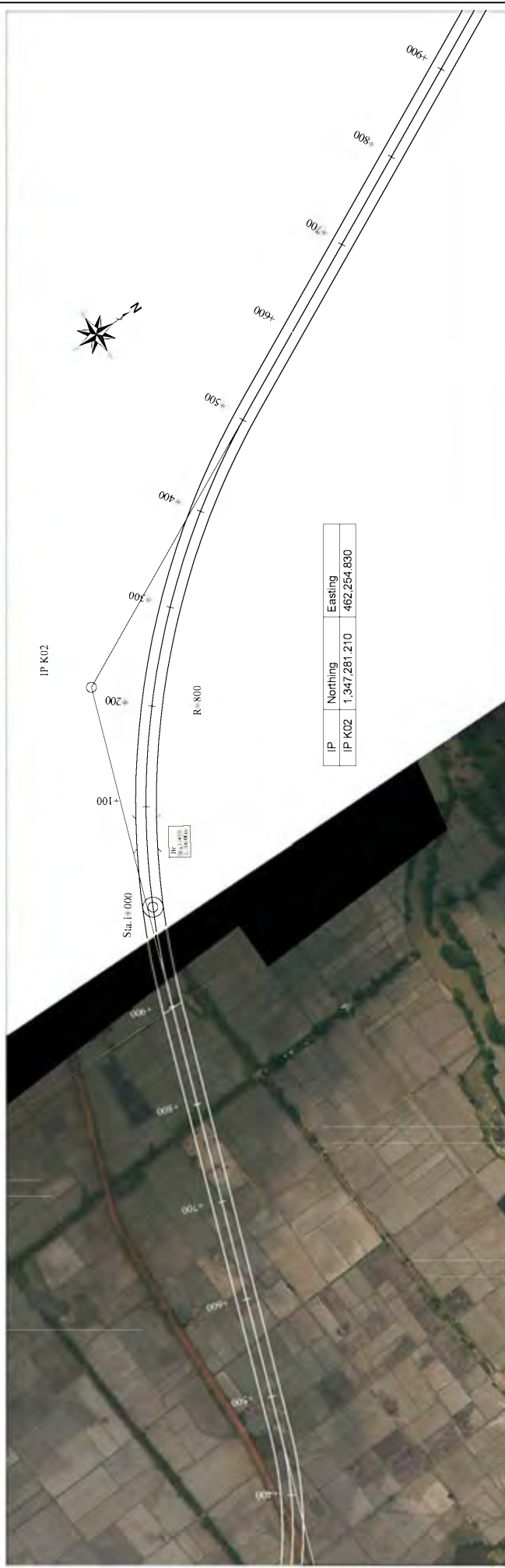
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IMPROVEMENT PROJECT

TITLE : **KEY PLAN**  
(KP75+100~KP78+100)

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| Drawing No. | KP - 16                    |
| Scale       | A1: 1/2,000<br>A3: 1/4,000 |
| Date        | AUG. 2013                  |



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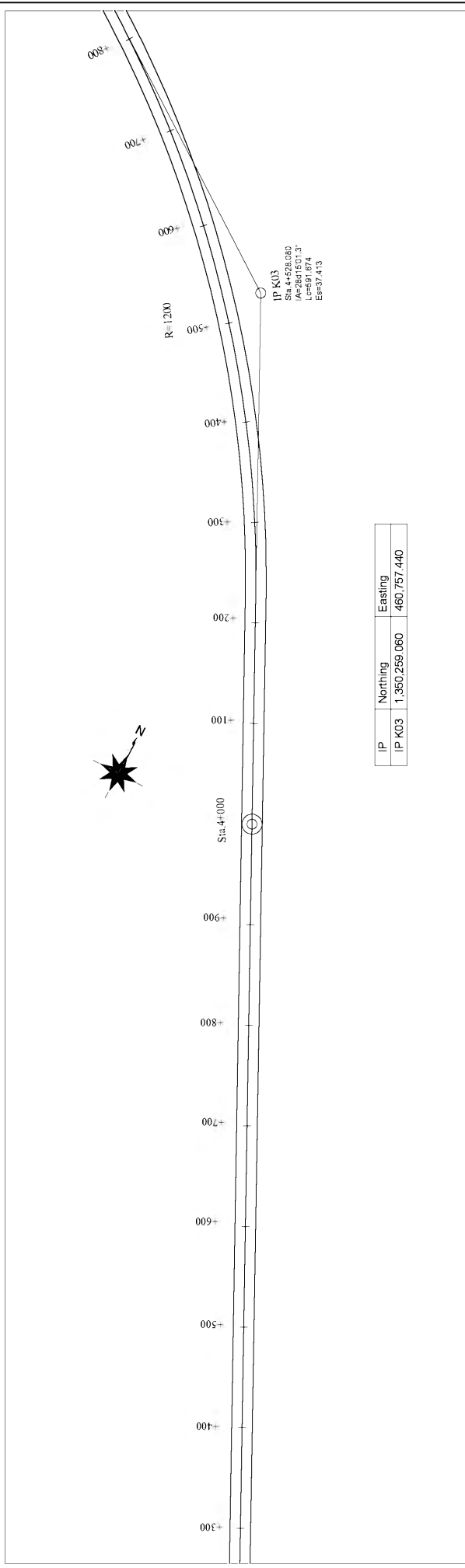
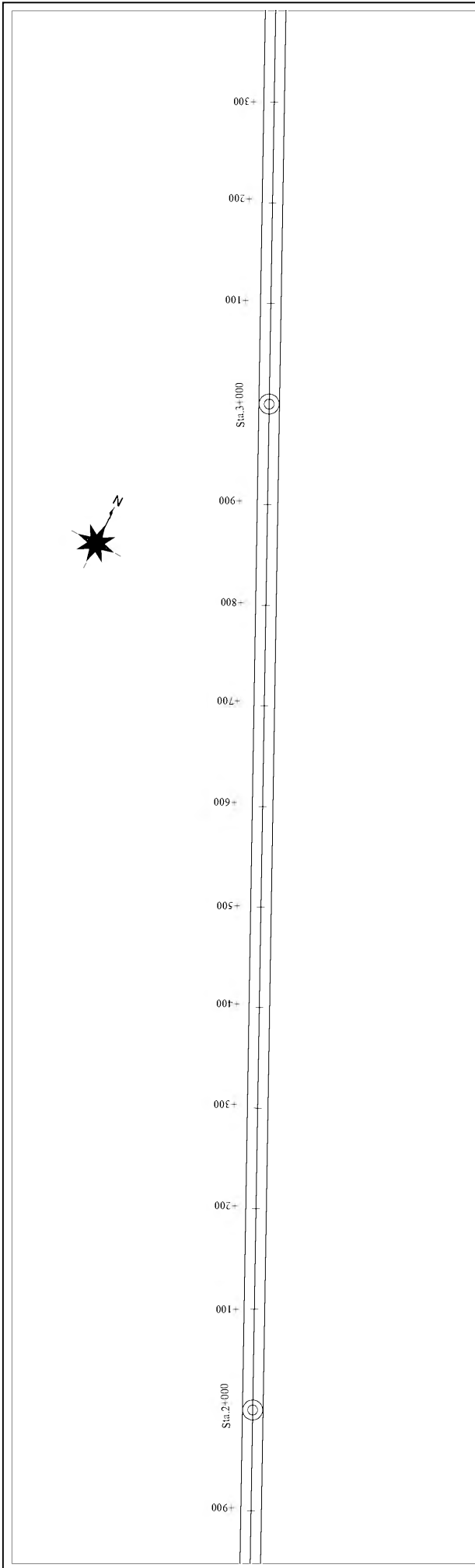
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Drawing No. **KP - 18**  
 Scale: A1: 1/2,000  
       A3: 1/4,000  
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**KEY PLAN**  
(KP80+900~Sta. 1+900)

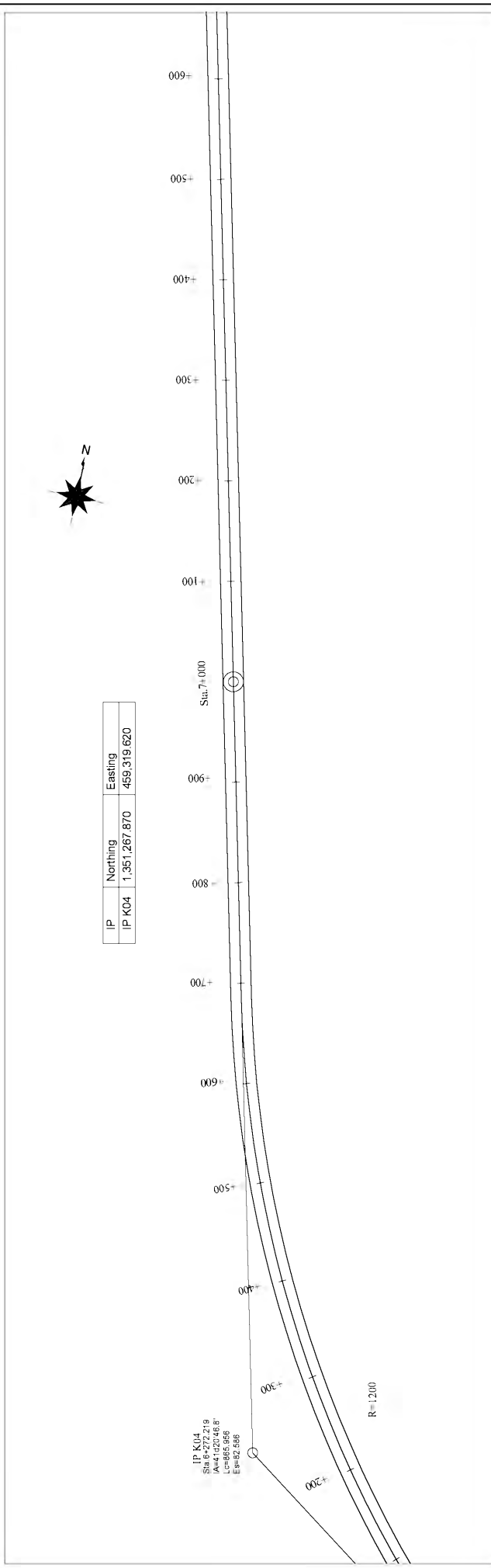
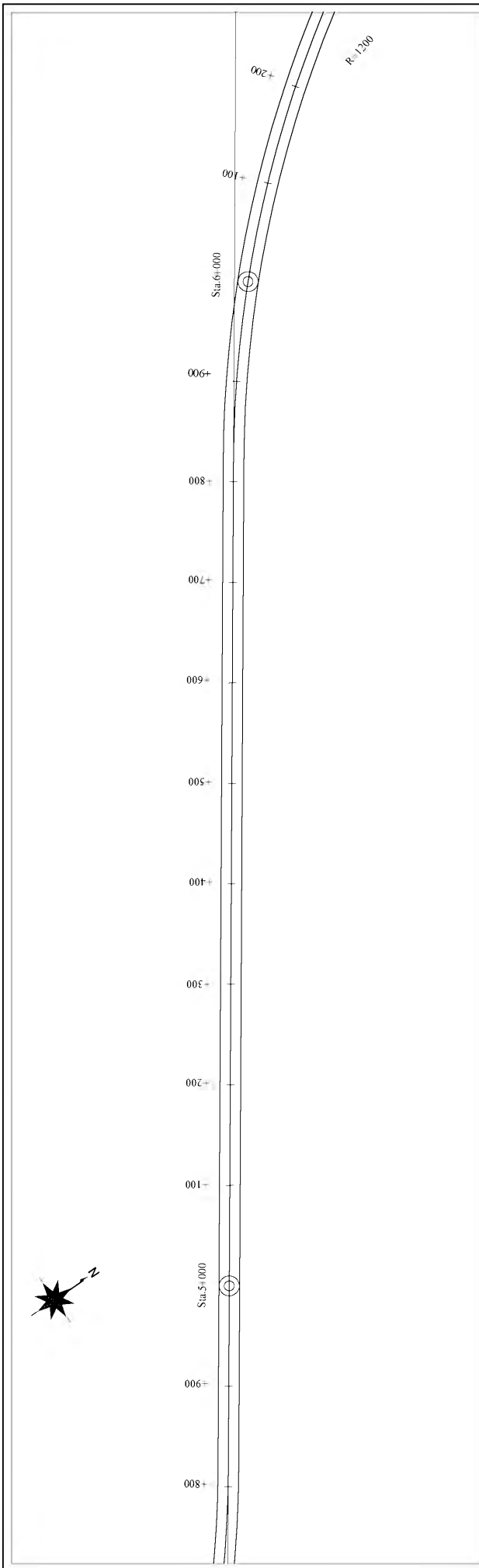
TITLE : PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 (SOUTH SECTION) IMPROVEMENT PROJECT



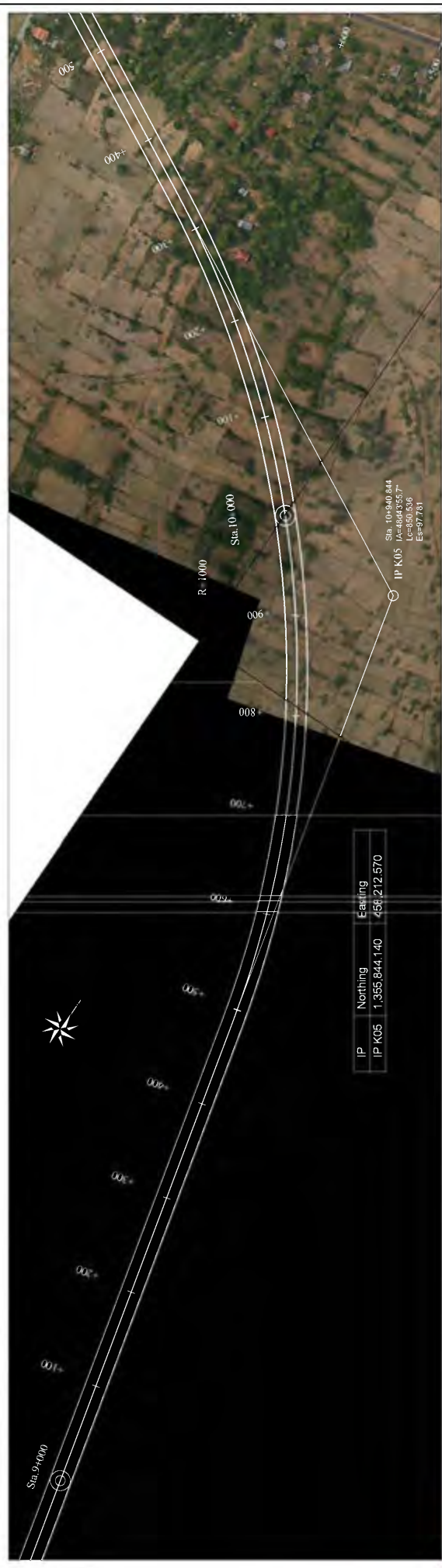
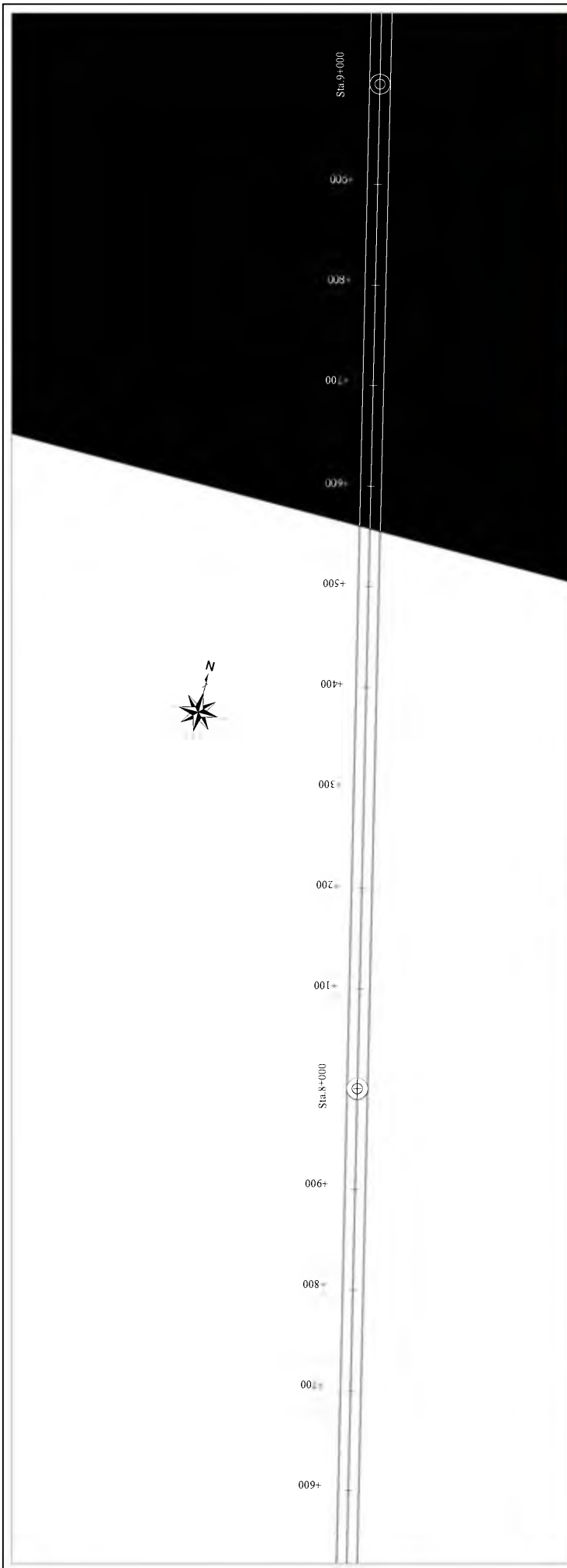


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|  | <p><b>KEY PLAN</b><br/>(Sta. 1+900~Sta. 4+800)</p>  | <p>Scale:<br/>A1: 1/2,000<br/>A3: 1/4,000</p>   | <p>Date:<br/>AUG. 2013</p>         |



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|   |  |  | <p>Scale<br/>A1: 1/2,000<br/>A3: 1/4,000</p>                      | <p>Date :<br/>AUG. 2013</p>       |
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|  |  |  | <b>IP</b>      | <b>Scale</b>                                       | <b>A1: 1/2,000</b><br><b>A3: 1/4,000</b> | <b>Date:</b>   |



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|   |  |  |   | <p>Scale<br/>A1: 1/2,000<br/>A3: 1/4,000</p> |
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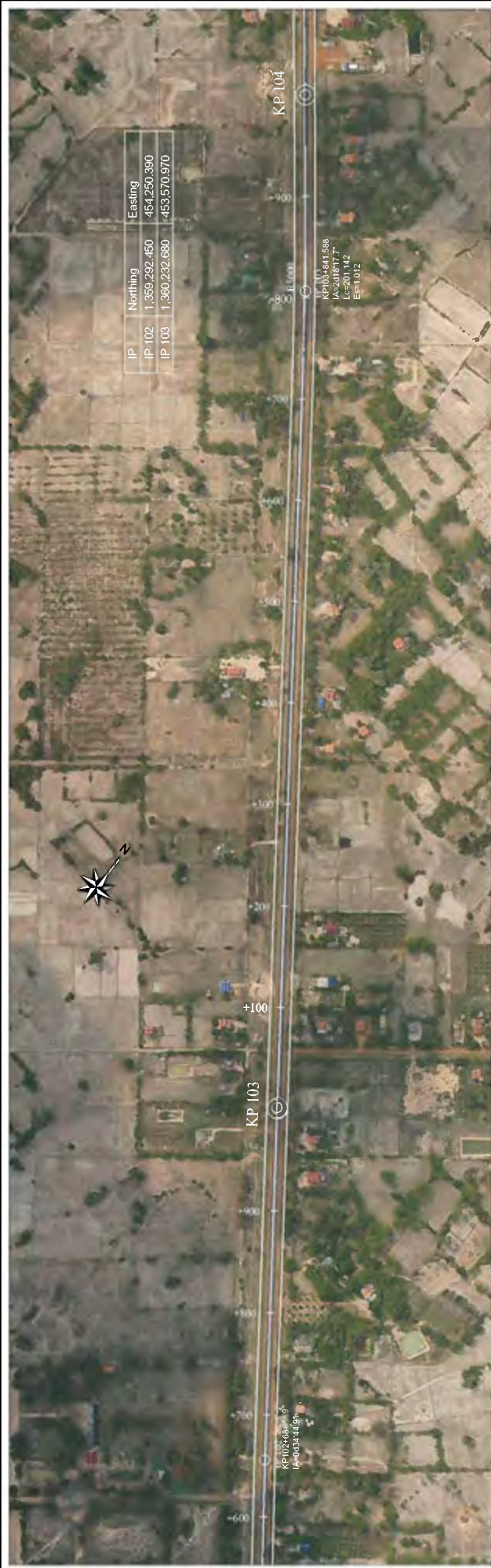
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TITLE : **KEY PLAN**  
**(KP99+800~KP102+600)**

Drawing No: **KP - 23**  
Scale: A1: 1/12,000  
A3: 1/14,000  
Date: **AUG. 2013**



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|   |  |   |  | Scale: A1: 1/2,000<br>A3: 1/4,000 |



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TITLE : **KEY PLAN**  
**(KP108+200~KP111+000)**

|             |                            |
|-------------|----------------------------|
| Drawing No. | KP - 26                    |
| Scale       | A1: 1/2,000<br>A3: 1/4,000 |
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TITLE: **KEY PLAN**  
**(KP111+000~KP113+800)**

Drawing No: **KP - 27**

|       |                            |
|-------|----------------------------|
| Scale | A1: 1/2,000<br>A3: 1/4,000 |
| Date  | AUG. 2013                  |



Drawing No: **KP - 28**  
 Scale: A1: 1/2,000  
 A3: 1/4,000  
 Date: **AUG. 2013**

**KEY PLAN**  
**(KP 113+800~KP 116+800)**

TITLE:  
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KINGDOM OF CAMBODIA

JAPAN INTERNATIONAL COOPERATION AGENCY  
KATAHIRA & ENGINEERS INTERNATIONAL

Drawing No: **KP - 29**  
 Scale: A1: 1/2,000  
 A3: 1/4,000  
 Date: **AUG. 2013**

**KEY PLAN**  
(KP116+800~KP119+800)

TITLE: PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 (SOUTH SECTION) IMPROVEMENT PROJECT



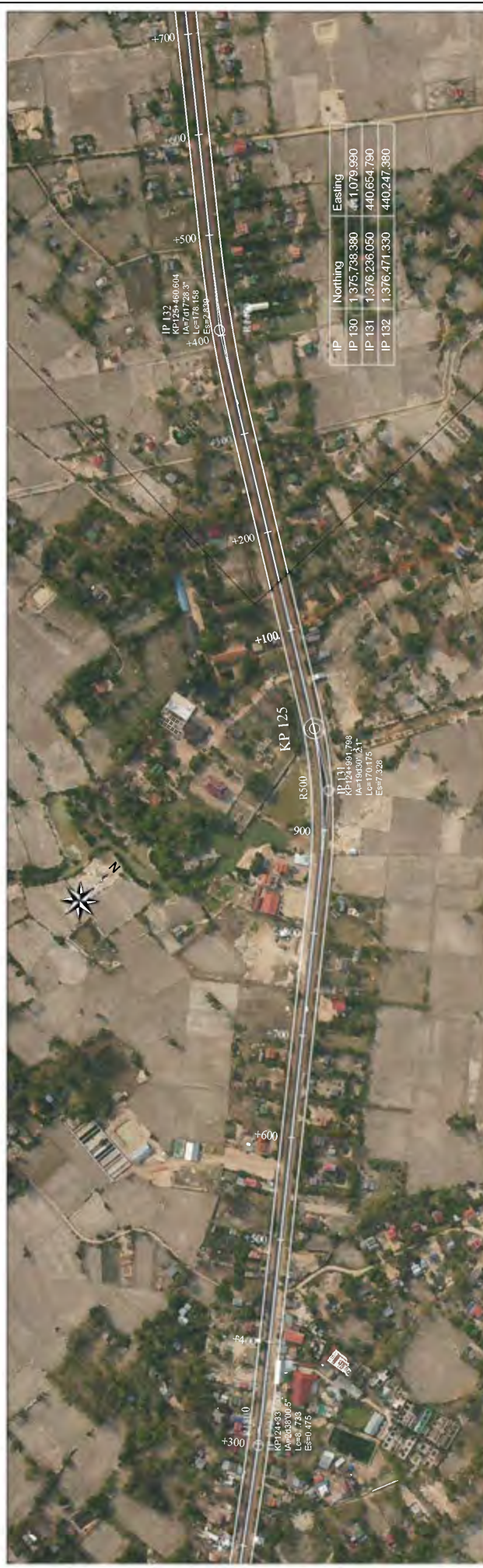


**MINISTRY OF PUBLIC WORKS & TRANSPORT**  
KINGDOM OF CAMBODIA

**JAPAN INTERNATIONAL COOPERATION AGENCY**  
KATAHIRA & ENGINEERS INTERNATIONAL

**TITLE :**  
PREPARATORY SURVEY FOR NATIONAL  
ROAD NO.5 (SOUTH SECTION)  
IMPROVEMENT PROJECT

**Drawing No.:** KP - 30  
**Scale:** A1: 1/2,000  
A3: 1/4,000  
**Date:** AUG. 2013



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| <br><b>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT</b><br>KINGDOM OF CAMBODIA | <b>JAPAN INTERNATIONAL COOPERATION AGENCY</b><br>KATAHIRA & ENGINEERS INTERNATIONAL | PREPARATORY SURVEY FOR NATIONAL<br>ROAD NO.5 (SOUTH SECTION)<br>IMPROVEMENT PROJECT | Drawing No: <b>KP - 31</b>                             |                                   |
|   |   |   | Title: <b>KEY PLAN</b><br><b>(KP122+700~KP125+700)</b> | Scale: A1: 1/2,000<br>A3: 1/4,000 |
|   |   |   | Date:  | AUG. 2013                         |





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TITLE :  
**KEY PLAN**  
**(KP 125+700~KP128+700)**

PREPARATORY SURVEY FOR NATIONAL  
ROAD NO.5 (SOUTH SECTION)  
IMPROVEMENT PROJECT

Drawing No: **KP - 32**  
Scale: A1: 1/2,000  
A3: 1/4,000  
Date: **AUG. 2013**





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KINGDOM OF CAMBODIA

**JAPAN INTERNATIONAL COOPERATION AGENCY**  
KATAHIRA & ENGINEERS INTERNATIONAL

**TITLE:**  
PREPARATORY SURVEY FOR NATIONAL  
ROAD NO.5 (SOUTH SECTION)  
IMPROVEMENT PROJECT

**KEY PLAN**  
(KP128+700~KP131+700)

**Drawing No:** KP - 33  
**Scale:** A1: 1/2,000  
A3: 1/4,000  
**Date:** AUG. 2013



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| <br>MINISTRY OF PUBLIC WORKS & TRANSPORT<br>KINGDOM OF CAMBODIA | JAPAN INTERNATIONAL COOPERATION AGENCY<br>KATAHIRA & ENGINEERS INTERNATIONAL | PREPARATORY SURVEY FOR NATIONAL<br>ROAD NO.5 (SOUTH SECTION)<br>IMPROVEMENT PROJECT | <b>TITLE :</b><br><b>KEY PLAN</b><br><b>(KP134+700~KP137+700)</b> | Drawing No. <b>KP - 35</b>        |
|  |  |   |   | Scale: A1: 1/2,000<br>A3: 1/4,000 |



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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE :<br/><b>KEY PLAN</b><br/><b>(KP137+700~KP140+700)</b></p> | <p>Drawing No. <b>KP - 36</b></p>            |
|   |  |  |   | <p>Scale<br/>A1: 1/2,000<br/>A3: 1/4,000</p> |



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|  |  |   |  | scale<br>A1: 1/2,000<br>A3: 1/4,000 |
|  |  |   | Date :<br>AUG. 2013  |                                     |



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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE :<br/><b>KEY PLAN</b><br/>(KP143+800~KP146+800)</p> | Drawing No. | KP - 38                    |
|   |  |  |  | Scale       | A1: 1/2,000<br>A3: 1/4,000 |



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|  |  |   |   | scale<br>A1: 1/2,000<br>A3: 1/4,000 |
|  |  |   | Date : <b>AUG. 2013</b>                                   |                                     |



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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE : <b>KEY PLAN</b><br/><b>(KP 149+800~KP 152+800)</b></p> | <p>Drawing No. <b>KP - 40</b></p>                       |
|   |  |  |   | <p>Scale: <b>A1: 1/2,000</b><br/><b>A3: 1/4,000</b></p> |



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| <br><b>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT</b><br><b>KINGDOM OF CAMBODIA</b> | <b>JAPAN INTERNATIONAL COOPERATION AGENCY</b><br><b>KATAHIRA &amp; ENGINEERS INTERNATIONAL</b> | <b>PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 (SOUTH SECTION) IMPROVEMENT PROJECT</b> | <b>TITLE :</b><br><b>KEY PLAN</b><br><b>(KP152+800-KP155+900)</b> | Drawing No: <b>KP - 41</b>        |
|  |  |  |   | scale: A1: 1/2,000<br>A3: 1/4,000 |



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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE : <b>KEY PLAN</b><br/><b>(KP155+900~KP159+000)</b></p> | <p>Drawing No. <b>KP - 42</b></p>            |
|   |  |  |   | <p>Scale<br/>A1: 1/2,000<br/>A3: 1/4,000</p> |





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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>TITLE : <b>KEY PLAN</b><br/><b>(KP159+000~KP162+000)</b></p> | <p>Drawing No. <b>KP - 43</b></p>  |
|   | <p>PREPARATORY SURVEY FOR NATIONAL ROAD NO.5 (SOUTH SECTION) IMPROVEMENT PROJECT</p>     |   |                                    |
|   | <p>Scale</p>   |   | <p>A1: 1/2,000<br/>A3: 1/4,000</p> |



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|  <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE : <b>KEY PLAN</b><br/><b>(KP 162+000~KP 165+000)</b></p> | <p>Drawing No. <b>KP - 44</b></p>          |
|   |  |  |   | <p>Scale : A1: 1/2,000<br/>A3: 1/4,000</p> |



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| <p>MINISTRY OF PUBLIC WORKS &amp; TRANSPORT<br/>KINGDOM OF CAMBODIA</p> | <p>JAPAN INTERNATIONAL COOPERATION AGENCY<br/>KATAHIRA &amp; ENGINEERS INTERNATIONAL</p> | <p>PREPARATORY SURVEY FOR NATIONAL<br/>ROAD NO.5 (SOUTH SECTION)<br/>IMPROVEMENT PROJECT</p> | <p>TITLE :<br/><b>KEY PLAN</b><br/><b>(KP165+000~KP168+000)</b></p> | <p>Drawing No. <b>KP - 45</b></p>            |
|   |  |  |   | <p>Scale<br/>A1: 1/2,000<br/>A3: 1/4,000</p> |
|   |  |  |   | <p>Date :<br/>AUG. 2013</p>                  |



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|  |  |   | TITLE : <b>KEY PLAN<br/>         (KP168+000~KP171+000)</b> |
|  |  |   | scale : A1: 1/2,000<br>A3: 1/4,000                         |
|  |  |   | Date : AUG. 2013   |