DEPARTMENT OF IRRIGATION
AND DRAINAGE MALAYSIA

ROYAL IRRIGATION DEPARTMENT

Minutes of Meeting

# The 31st Meeting of Malaysia – Thailand Joint Evaluation Team

# on Golok River Mouth Improvement Project

**16 – 17 May 2017**

**Johor Bahru, Malaysia**

**Minutes of Meeting**

# The 31st Meeting of Malaysia- Thailand Joint Evaluation Team on The Golok River Mouth Improvement Project 16 – 17 May 2017 Johor Bahru, Malaysia

## AGENDA 1: OPENING ADDRESS

Capt. (R) Ir. Haji Anuar Bin Haji Yahya, the leader of the Malaysian delegates, welcomed the Thai delegates to the 31st Meeting of Malaysia – Thailand Joint Evaluation Team (JET) on Golok River Mouth Improvement Project on 16th to 17th May 2017.

Mr. Pradab Kladkhempetch, the leader of the Thai delegates, expressed his appreciation for the warm welcome and arrangements for the Meeting.

Both sides introduced their delegates and the list of delegates is as shown in APPENDIX A.

## AGENDA 2: ADOPTION OF AGENDA

The Malaysian side presented the proposed agenda for the Meeting. The Meeting agreed to proceed according to the proposed agenda as shown in APPENDIX B.

## AGENDA 3: MATTERS FOR CONSIDERATION

### 3.1 Report on Monitoring and Evaluation of Golok River Mouth

The 2017 post-monsoon survey was carried out by the Malaysian side in March 2017, as shown in APPENDIX C. It was observed that sedimentation area on the Malaysian side have decreased whilst erosion area on the Thai side has increased compared to the pre-monsoon survey (October 2016).

The sedimentation volume (where bed level is shallower than -3.0m MSL within the navigation channel) have decreased compared to the condition in during pre-monsoon (October 2016) whereby no sedimentation was observed inside the navigation channel.

The maximum bed level at the river mouth was observed to be -3.0m MSL, located at the navigation channel; the observed bed level was shallower than previous survey which was -3.1m MSL (October 2016).

The deepest bed level around tip of Thai breakwater is observed to be -5.5 m MSL which may lead to instability of Thai breakwater. This level is deeper compared to previous survey in October 2016.

No correlation could be made between the maximum discharge reading at the cableway station (X.119A) with the opening/closing of the Golok River mouth since only the factor from the river flow is considered and the discharges are recorded about 40km upstream of the river mouth.

Hence, the Meeting agreed that there is a need to measure the wave parameters that affect the river mouth. Installation of a new station for measuring the discharge at the river mouth area should also be considered.

### 3.2 Maintenance Dredging of Golok River Mouth

As agreed in the JET 25, JTWG 32 and JSC 14, the maintenance dredging is required based on the following criteria:

(1) When the cross section area of the river mouth between Thailand and Malaysia breakwater tip is blocked up to 30% (for drainage purpose); or
(2) When the bed level of the river mouth is at -2.0 m MSL or shallower (for navigation purpose);

The sediment patterns are to be monitored for at least 2 consecutive monsoon seasons in order to identify the need of maintenance dredging.

<u>Section across Thai breakwater and Malaysian breakwater</u>

The post-monsoon survey (March 2017) as shown in APPENDIX D showed that:

(a) The cross section of the river mouth is fully open (0% blockage).
(b) The shallowest sea bed level at the navigation channel is at -3.0m MSL, which is deeper than the dredging criteria (-2.0m MSL).
(c) Maintenance dredging is not required based on the post-monsoon (March 2017) survey.

The Meeting agreed that based on the results of the pre-monsoon (October 2016) and post-monsoon (March 2017) surveys, the river mouth was not affected by sedimentation since it did not meet the dredging criteria. Hence, there is no need for the maintenance dredging of Golok River Mouth at the time being.

The Malaysian side informed that an additional criteria for maintenance dredging for minimum width for vessel to navigate inside the channel for both side will be proposed in future JET meeting when necessary.

### 3.3 Protection Work of Transit Point B

The Meeting was informed that the Joint Technical Meeting for Golok River Mouth Physical Modelling Works No. 2 was held on 28 February – 1 March 2017 in Royal Irrigation Department (RID) Hydraulic Laboratory in Nonthaburi, Thailand.

The Meeting was informed that due to the restriction of the 3D physical model, 2D physical model was performed to study and determine the suitable shape of the protection works at Transit Point B. Three (3) scenarios were tested on the protection works for Transit Point B namely, existing condition, oval shaped protection work and hexagonal shaped protection work.

Each of the 2D physical models will be carried out for various discharge capacity and water level to assess flow pattern, scouring depth and scouring pattern around Transit Point B. Hence, thirty (30) number of scenarios were tested in 2D physical model i.e. flume test as tabulated in Table 1.

Table 1: 2D physical model test

| **Protection works for Transit Point B (3 scenarios)** | **X** | **Discharge (5 scenarios)** | **X** | **Water level (2 scenarios)** |
|---|---|---|---|---|
| 1. Existing Condition<br>2. Oval Shape<br>3. Hexagonal Shape | X | Q = 500 CMS.<br>Q = 750 CMS.<br>Q = 1,000 CMS.<br>Q = 1,500 CMS.<br>Q = 2,000 CMS. | X | +0.0 m. MSL.<br>+1.0m. MSL. |
| **Total = 3 x 5 x 2 = 30 scenarios** | | | | |

Water level measurement

The Meeting was informed that the measurement of water level at 50m upstream of Transit Point B can be related to the backwater effect which is the rise in surface elevation of flowing water upstream from and as a result of an obstruction to flow. The result of 2D physical model test is as shown in APPENDIX E.

For high discharge, it is noted that the existing condition caused significant rise in water level compared to Transit Point B with oval shaped and hexagonal shaped protection work. Despite the tidal level, the backwater effect caused by the oval shaped and hexagonal shaped protection work are comparable.

Velocity measurement

The Meeting was informed that uniform velocity distribution at Transit Point B and 60m downstream of Transit Point B were observed for both Transit Point B with oval shaped protection work and Transit Point B with hexagonal shaped protection work. This phenomenon is expected to have more positive effects for navigation around Transit Point B compared to the existing condition. The result of 2D physical model test is as shown in APPENDIX F.

Head loss through the protection work

The Meeting was informed that the head loss through Transit Point B protection work for the existing condition at tidal level 0.0 m MSL and +1.0 m MSL are relatively higher at Transit Point B with oval shaped protection work than at and Transit Point B with hexagonal shaped protection work. The result of 2D physical model test is as shown in APPENDIX G.

Scour depth

The Meeting was informed that maximum scour depth around Transit Point B protection work for the existing condition is relatively higher than the other scenarios at tidal level 0.0 m MSL and +1.0 m MSL. The maximum scour depth around hexagonal shaped protection work is lowest at all scenarios. The result of 2D physical model test is as shown in APPENDIX H.

Based on the 2D physical model test results, the Meeting agreed that Thai side shall proceed with detailed design for the hexagonal shape protection works around Transit Point B. Thai side will present the detailed design in the next JET meeting.

The Meeting also agreed that this issue shall be referred to the JTWG for endorsement prior to implementation.

### 3.4 Rehabilitation and Protection Works at Golok River Mouth

The Meeting agreed on the recommendations of the Joint Technical Meeting for Golok River Mouth Physical Modelling Works No. 2 for the 3D Physical Model as follows:

(a) To study and assess the flow pattern around Transit Point B and its protection work including the existing and proposed rehabilitation works at Golok River Mouth (breakwater extension, river training wall and dyke) in association with actual ocean conditions;

(b) To study and assess the 3D Physical Model with the actual river bed model;

(c) To reaffirm the measurement of flow direction and velocity distribution upstream and downstream of Transit Point B;

(d) To study and assess scouring around the tip of Thai Breakwater.

The Meeting also agreed that the 3D Physical Model shall be tested on two (2) scenarios: (i) Existing condition and (ii) Proposed rehabilitation works with 215m extension of Thai breakwater, Thai training wall, Malaysian dyke and hexagonal shaped protection work around Transit Point B.

The Thai side informed that the physical model test is expected to be completed by end of May 2017 and the Environmental Impact Assessment (EIA) study is expected to obtain approval by December 2017.

The Malaysian side informed that a consultant for detailed design of additional dyke will be appointed by June 2017 and the detailed design period will take ten (10) months.

The revised schedule of work for both sides is as shown in APPENDIX J.

### 3.5 Mutual Calibration of Rating Curve at Cableway Station

In 2016, eleven (14) mutual gauging measurements were done monthly except in January and June 2016 measurements were done on two occasion. In 2017, three (3) mutual gauging measurements were done monthly. The mutual gauging measurements are as shown in APPENDIX K.

The Meeting agreed to adopt the rating curve developed using data measured by River Surveyor (M9) in 2015 and 2016 as the mutual rating curve 2016. The mutual rating curve 2016 are as shown in APPENDIX L.

### 3.6 Real Time Monitoring System and Joint Website for Golok River Basin

Existing Telemetry stations and joint web site

The Malaysian side informed that the hydrological data on the joint website should be provided at hourly intervals. Hence, the Thai side agreed to share the hydrological data at 15 minutes interval. The Thai side informed that the online and backup data on Thai Joint web site (http://hydro-8.com/Golok) for 15 minute interval is currently in the process of upgrading to English version.

Referring to the minutes of JET21 and JET30, both sides agreed to revise the velocity measurement method for the gauging works as follows:

| No. | Flow Type | No. of Reading | Divination | Method |
|---|---|---|---|---|
| 1. | Low Flow (<1 meter depth) | 1 reading | 0.6d | Current meter & River Surveyor (M9) |
| 2. | Medium Flow (1m – 4m depth) | 2 readings | 0.2d and 0.8d | Current meter & River Surveyor (M9) |
| 3. | High Flow (>4 meter depth) | - | - | River surveyor (M9) |

The Thai side informed the datum of Cableway station (X.119A) to be +10.686m Thai MSL and the reference datum is at T.11 (located at the Customs house in Tak Bai). Both sides agreed to use the same datum for purpose of developing mutual rating curve.

New Telemetry stations and joint website

The Thai side informed that the data sharing of six (6) new telemetry stations are under progress. The new expected completion date is July 2017. Both sides agreed that data sharing will be conducted when both sides are ready. The revised schedule for new telemetering stations is as shown in APPENDIX M.

## AGENDA 4: OTHER MATTERS

### 4.1 Integrated River Basin Management (IRBM) Plan for Golok River

The Malaysian side reported that:-

(a) The Malaysian side working committee is still working on the amendments to the principal Agreement. The first draft on the amendments to the principal Agreement is not ready to be discussed in this JET meeting.

(b) The Meeting agreed that the first draft on the amendments to the principal Agreement will be presented in the 32nd JET meeting.

### 4.2 Road Map for Joint Implementation Works

The Meeting was informed that the joint implementation works are as follows:

(a) The pre- and post-monsoon bathymetry survey will be done tentatively by October 2017 and March 2018 respectively by Thai side;

(b) The Feasibility and EIA study by Thai side was completed in April 2017;

(c) Mutual gauging will be performed every month;

(d) The physical model study will be completed in May 2017;

(e) Both sides will share data of new telemetering station on joint website when both sides are ready;

(f) Malaysian side will present the first draft on the amendments to the principal Agreement in the 32nd JET meeting.

The Meeting agreed that the road map for joint implementation works as shown in APPENDIX N.

### 4.3 Date and venue for next JET meeting

The meeting proposed the date and venue for the next JET meeting is as follows:

Date: November 2017
Venue: Chiang Rai, Thailand.

## AGENDA 5: MATTERS TO BE REFERRED TO THE JTWG

### Matters for Consideration

1. Report of Monitoring and Evaluation of Golok River Mouth
2. Maintenance Dredging of Golok River Mouth
3. Protection Work at Transit Point B
4. Rehabilitation and Protection Works at Golok River Mouth
5. Mutual Calibration of Rating Curve at Cableway Station
6. Real Time Monitoring System and the Joint Websites for Golok River Basin

### Other Matters

1. Integrated River Basin Management (IRBM) Plan for Golok River

**AGENDA 6: ADOPTION OF MINUTES OF THE MEETING**

The Meeting agreed to adopt the minutes of meeting of the thirty first Meeting of Malaysia – Thailand Joint Evaluation Team on the Golok River Mouth Improvement Project.

(Capt. (R) Ir. Haji Anuar Bin Haji Yahya)
Co-Chairman
Joint Evaluation Team, Malaysia

P. Kladkhempetch

(Mr. Pradab Kladkhempetch)
Co-Chairman
Joint Evaluation Team, Thailand

**APPENDIX A**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## LIST OF MALAYSIAN DELEGATES

| | | | |
|---|---|---|---|
| 1. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Capt. (R) Ir. Haji Anuar Bin Haji Yahya<br>Director<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6019 5514343<br>iranuar@water.gov.my |
| 2. |  | Name<br>Designation<br>Department<br><br><br>Contact no.<br>Email | Dato' Ir. Nor Hisham bin Mohd. Ghazali<br>Director<br>Division of Water Resources Management and Hydrology<br>Department of Irrigation and Drainage Malaysia<br>+6019 2666553<br>hisham@water.gov.my |
| 3. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Ir. Ng Kok Seng<br>Director<br>Division of River Basin Management<br>Department of Irrigation and Drainage Malaysia<br>+6019 2333739<br>ngks@water.gov.my |
| 4. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Haji Rashiddi bin Haji Hussein<br>Project Engineer<br>Kelantan Federal Project Implementation Unit<br>Department of Irrigation and Drainage Malaysia<br>+6013 9832006<br>rashiddi@water.gov.my |
| 5. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Ir. Tajudin bin Sulaiman<br>Deputy Director<br>Division of River Basin Management<br>Department of Irrigation and Drainage Malaysia<br>+6012 2233314<br>tajudin@water.gov.my |

**APPENDIX A**

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## LIST OF MALAYSIAN DELEGATES

| | | | |
|---|---|---|---|
| 6. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Abdul Aziz bin Abas<br>Senior Engineer<br>Division of Flood Management<br>Department of Irrigation and Drainage Malaysia<br>+6019 9306116<br>hjaziz@water.gov.my |
| 7. |  | Name<br>Designation<br>Department<br><br><br>Contact no.<br>Email | Ir. Roslina binti Yusop<br>Senior Engineer<br>Division of Water Resources Management and Hydrology<br>Department of Irrigation and Drainage Malaysia<br>+6019 3555149<br>lina@water.gov.my |
| 8. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Abd Khadir bin Abd Aziz<br>Senior Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6012 5121134<br>abdkhadir@water.gov.my |
| 9. |  | Name<br>Designation<br>Department<br>Contact no.<br>Email | Mrs. Marziah binti Mohamad<br>Senior Engineer<br>Department of Irrigation and Drainage Kelantan<br>+6019 9150366<br>marziah@water.gov.my |
| 10. |  | Name<br>Designation<br>Department<br><br><br>Contact no.<br>Email | Mr. Mohd Eizam bin Yusof<br>Engineer<br>Division of Water Resources Management and Hydrology<br>Department of Irrigation and Drainage Malaysia<br>+6016 4844359<br>eizam@water.gov.my |

**APPENDIX A**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## LIST OF MALAYSIAN DELEGATES

| | | | |
|---|---|---|---|
| 11. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Ms. Carine Wong Koh Yin<br>Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6012 2198032<br>carine@water.gov.my |
| 12. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Ahmad Ikhwan bin Abdul Wahid<br>Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6013 6093085<br>ahmadikhwan@water.gov.my |

**APPENDIX A**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## SECRETARIAT

| | | | |
|---|---|---|---|
| 1. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Khairulnizam b. Md. Yasin<br>Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+ 6012 2426919<br>khairulnizam@water.gov.my |
| 2. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Mohd. Khairil Annuar bin Mohd. Isa<br>Assistant Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6017 7577746<br>khairil@water.gov.my |
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| 4. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Mohammed Hairey bin Md Salih<br>Assistant Engineer<br>Division of Coastal Zone Management<br>Department of Irrigation and Drainage Malaysia<br>+6019 7026646<br>hairey@water.gov.my |
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**APPENDIX A**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## LIST OF THAI DELEGATES

| | | | |
|---|---|---|---|
| 1. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Pradab Kladkhempetch<br>Director<br>Bureau of Project Management<br>Royal Irrigation Department Thailand<br>+668 4700 0541<br>pradab_kla@hotmail.com |
| 2. |  | Name<br>Designation<br>Department<br>Contact no.<br>Email | Mr. Prinya Kamolsin<br>Expert on Irrigation (Hydraulic Engineering)<br>Royal Irrigation Department<br>+668 4700 5339<br>prinyakamolsin@yahoo.com |
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**APPENDIX A**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## LIST OF THAI DELEGATES

| | | | |
|---|---|---|---|
| 6. |  | Name<br>Designation<br>Department<br><br><br>Contact no. | Mr. Kanchadin Srapratoom<br>Director,<br>Foreign Project Management and International Affairs Division, Bureau of Project Management<br>Royal Irrigation Department<br>+662 241 2688 |
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| 9. |  | Name<br>Designation<br>Department<br><br>Contact no.<br>Email | Mr. Attapan Diloksopon<br>Civil Engineer, Professional Level<br>Bureau of Project Management<br>Royal Irrigation Department<br>+668 0270 9997<br>atdplk@gmail.com |
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**APPENDIX B**

# THE 31ST MEETING OF MALAYSIA – THAILAND JOINT EVALUATION TEAM (JET) ON THE GOLOK RIVER MOUTH IMPROVEMENT PROJECT

## PROPOSED AGENDA

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**AGENDA 1: OPENING SESSION**

**AGENDA 2: ADOPTION OF AGENDA**

**AGENDA 3: MATTERS FOR CONSIDERATION**

- 3.1 MONITORING AND EVALUATION OF GOLOK RIVER MOUTH
- 3.2 MAINTENANCE DREDGING OF GOLOK RIVER MOUTH
- 3.3 PROTECTION WORK AT TRANSIT POINT B
- 3.4 REHABILITATION AND PROTECTION WORKS AT GOLOK RIVER MOUTH
- 3.5 MUTUAL CALIBRATION OF RATING CURVE AT CABLEWAY STATION
- 3.6 REAL TIME MONITORING SYSTEM AND THE JOINT WEBSITE FOR GOLOK RIVER BASIN

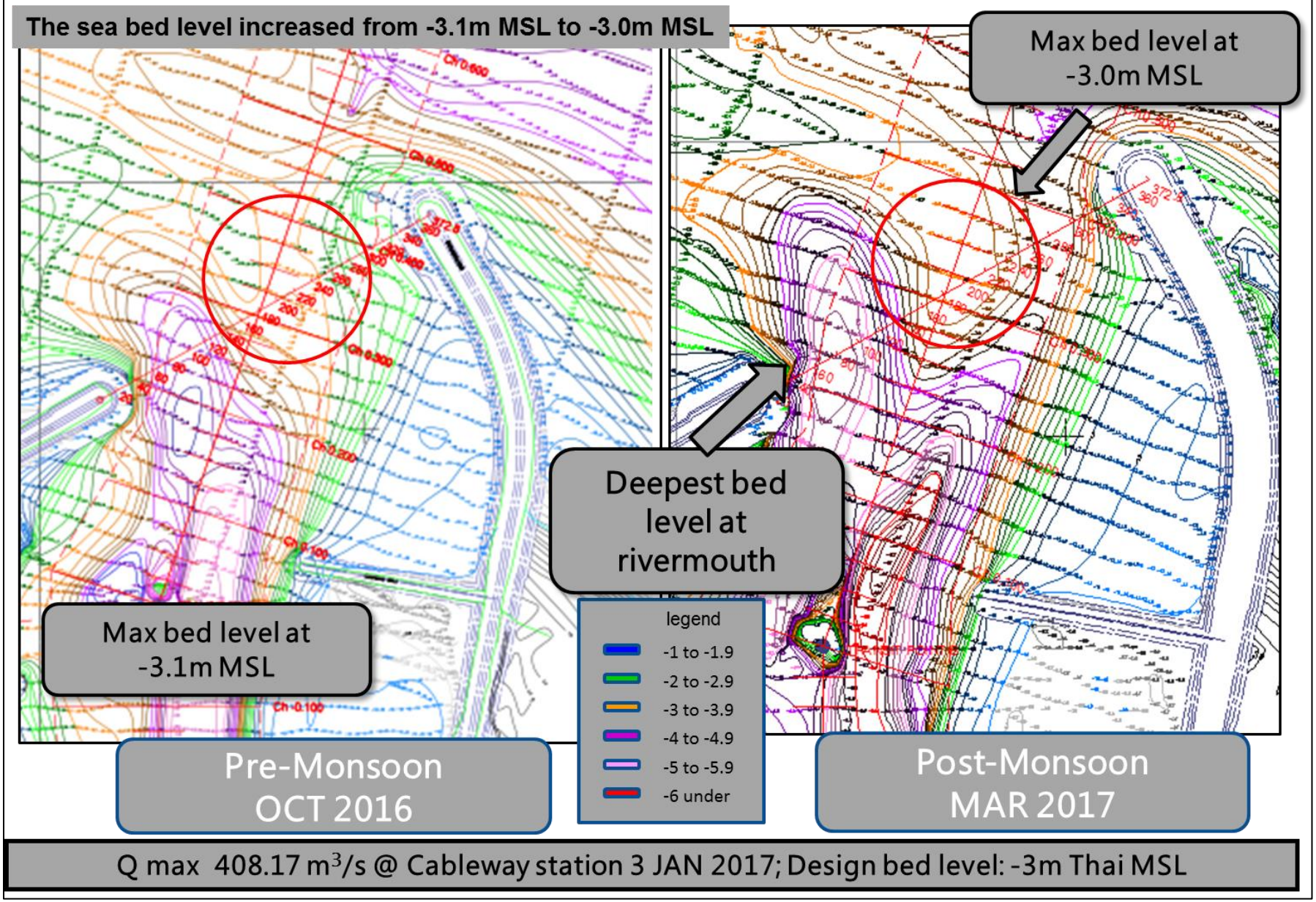
**AGENDA 4: OTHER MATTERS**

- 4.1 INTEGRATED RIVER BASIN MANAGEMENT (IRBM) PLAN FOR GOLOK RIVER BASIN
- 4.2 ROAD MAP FOR JOINT IMPLEMENTATION WORKS
- 4.3 DATE AND VENUE FOR NEXT MEETING

**AGENDA 5: MATTERS TO BE REFERRED TO JTWG**

**AGENDA 6: ADOPTION OF MINUTES OF MEETING**

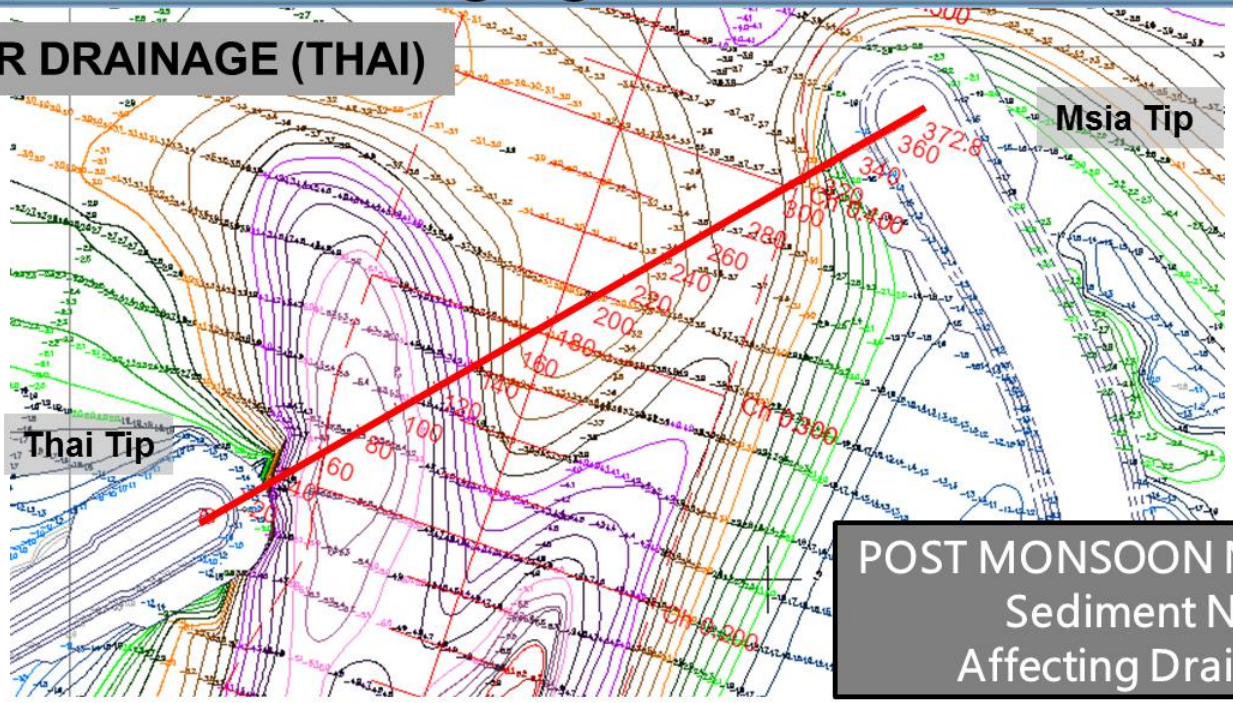
# Monitoring and Evaluation of Golok River Mouth



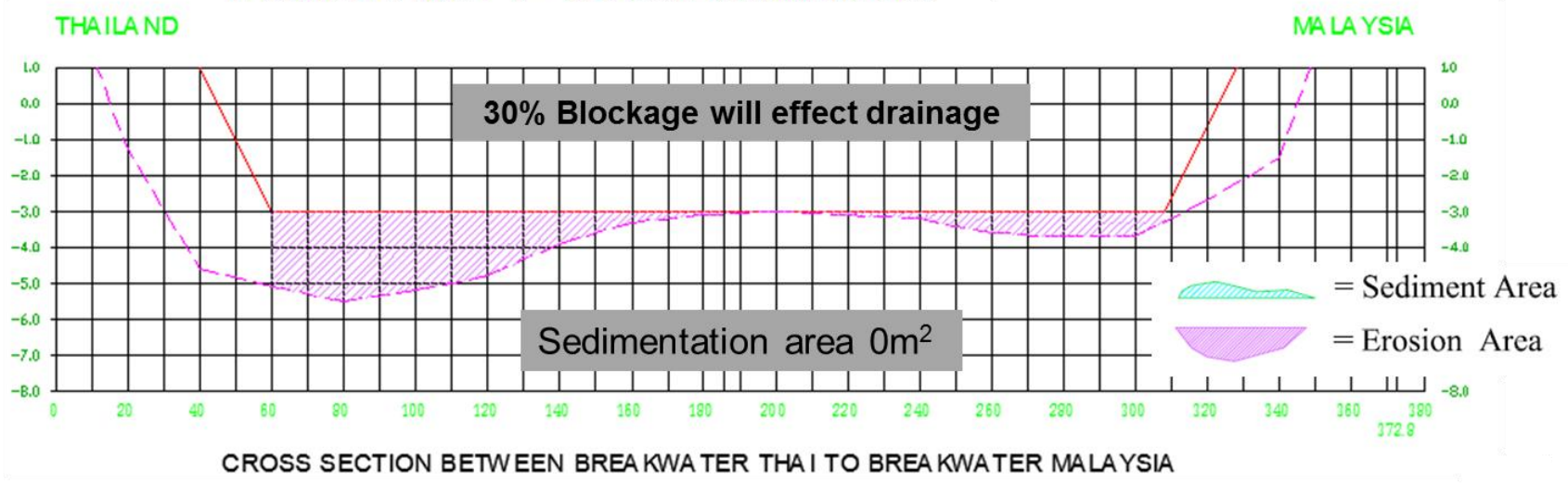

Q max 408.17 $m^3/s$ @ Cableway station 3 JAN 2017; Design bed level: -3m Thai MSL

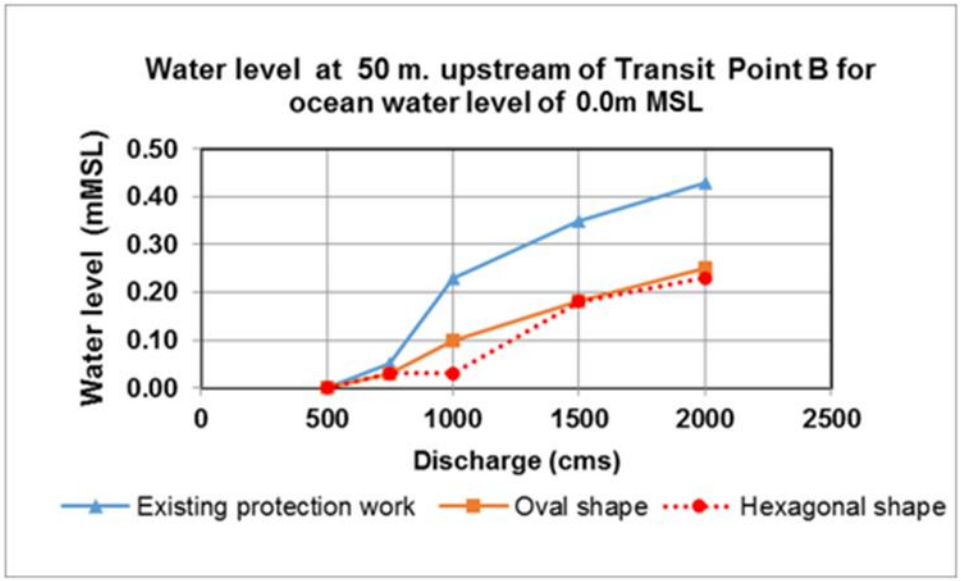
# Maintenance Dredging of Golok River Mouth

## CRITERIA FOR DRAINAGE (THAI)

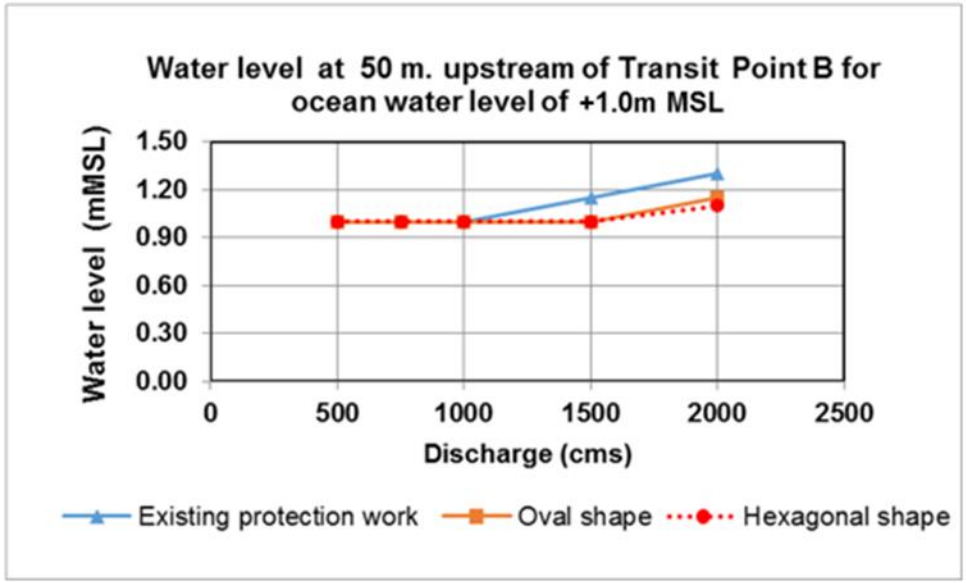



POST MONSOON MAR 2017
Sediment Not
Affecting Drainage

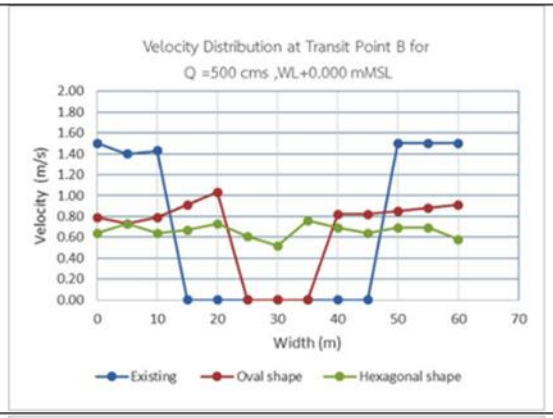
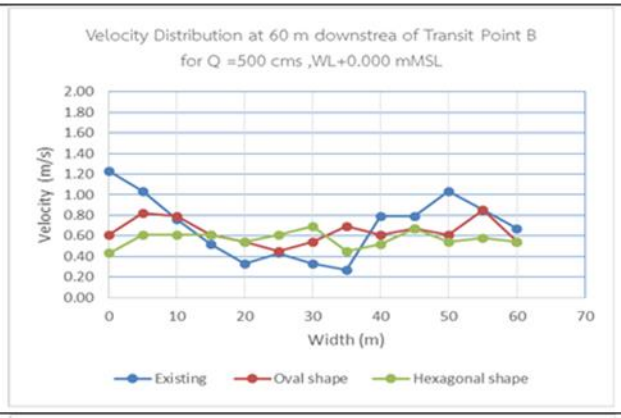
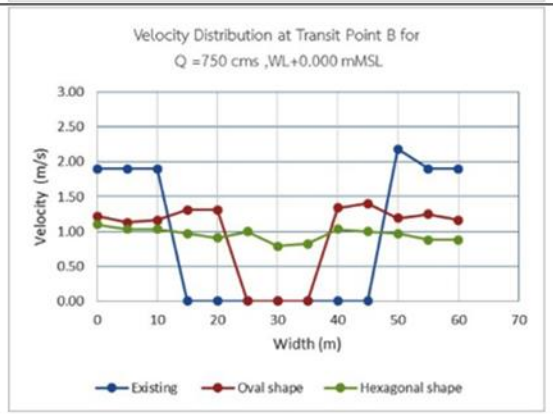
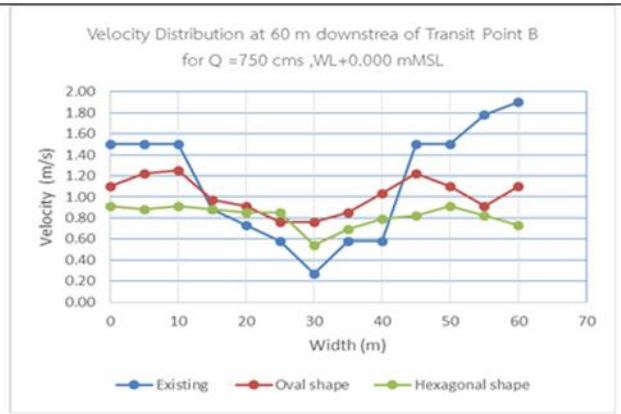
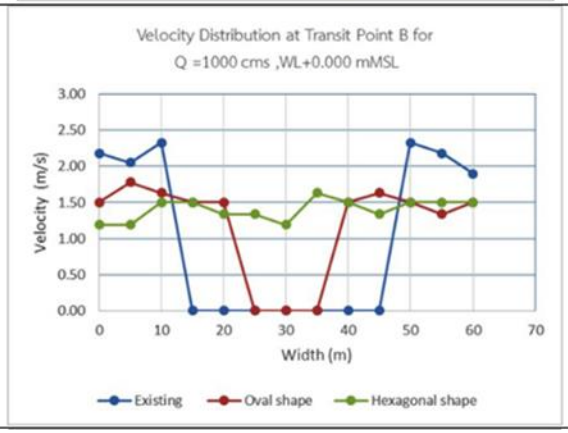
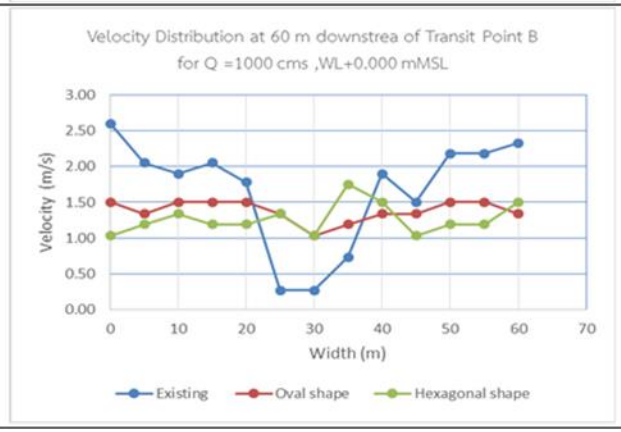


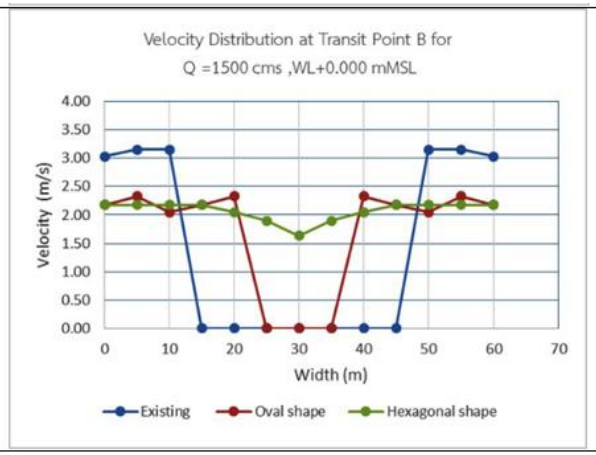
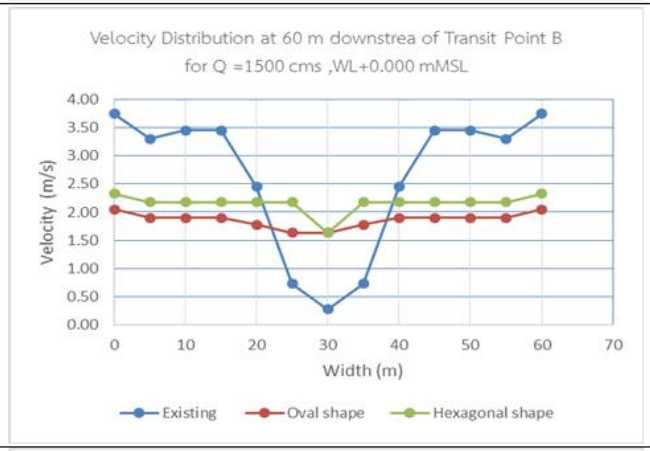
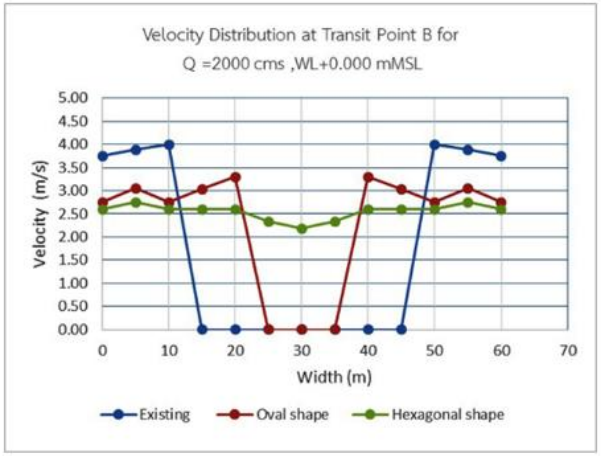
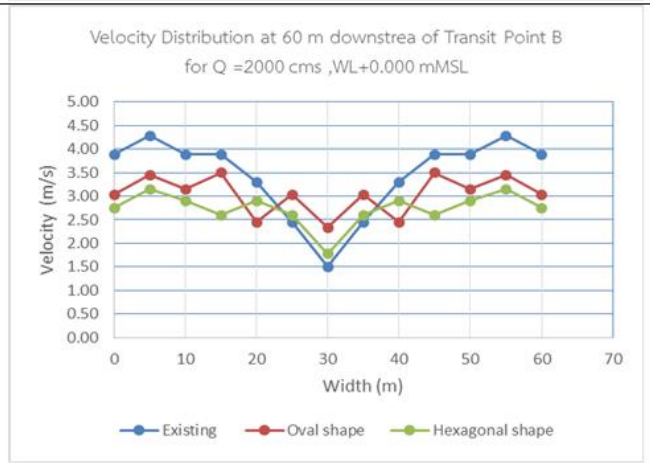


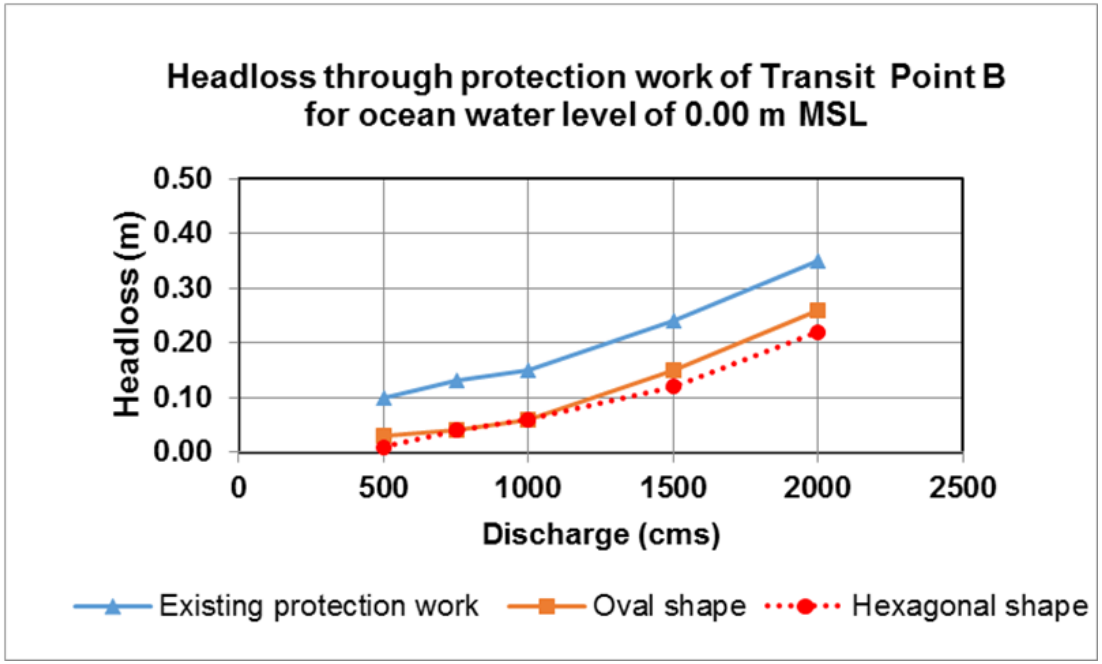

Water level measured at 50m upstream of Transit Point B (tidal level at 0.0m MSL)

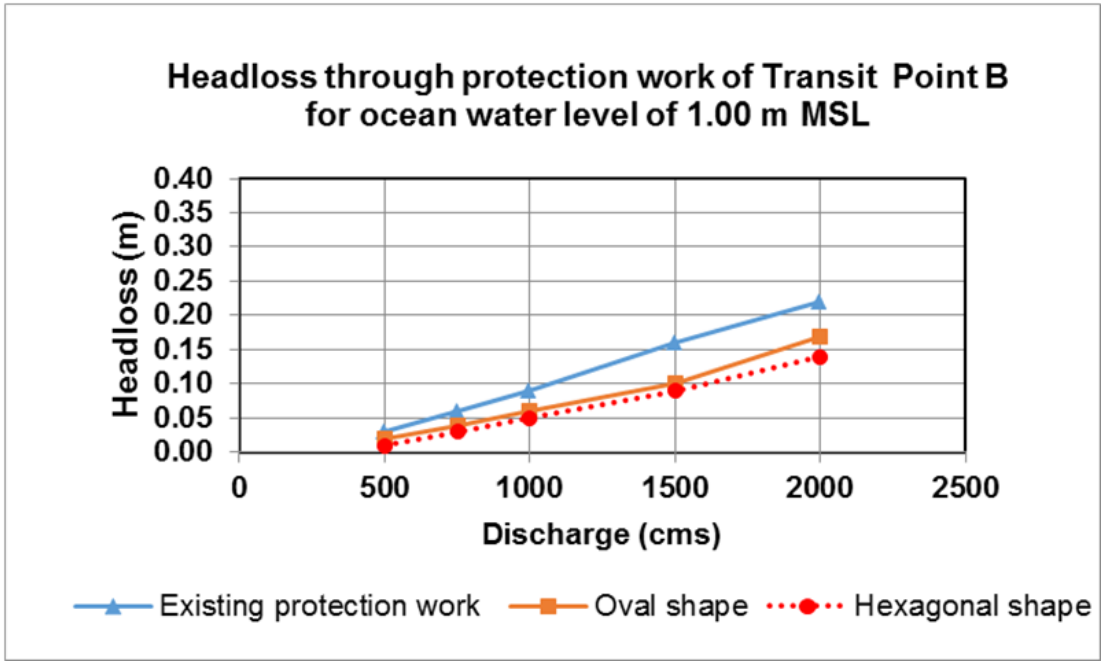


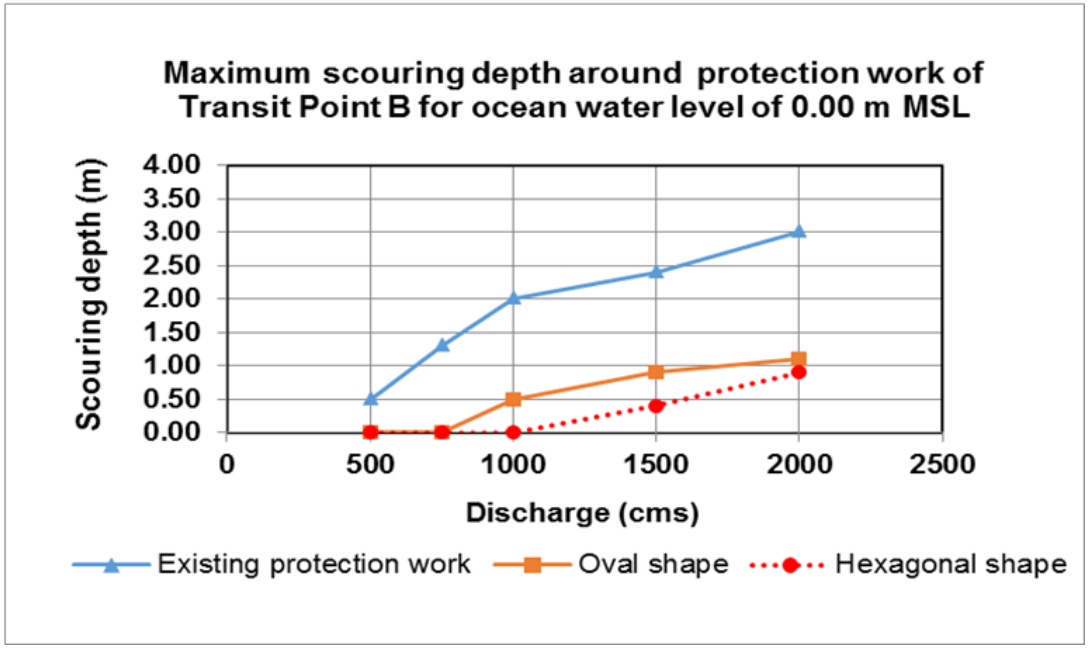

Water level measured at 50m upstream of Transit Point B (tidal level at +1.0m MSL)

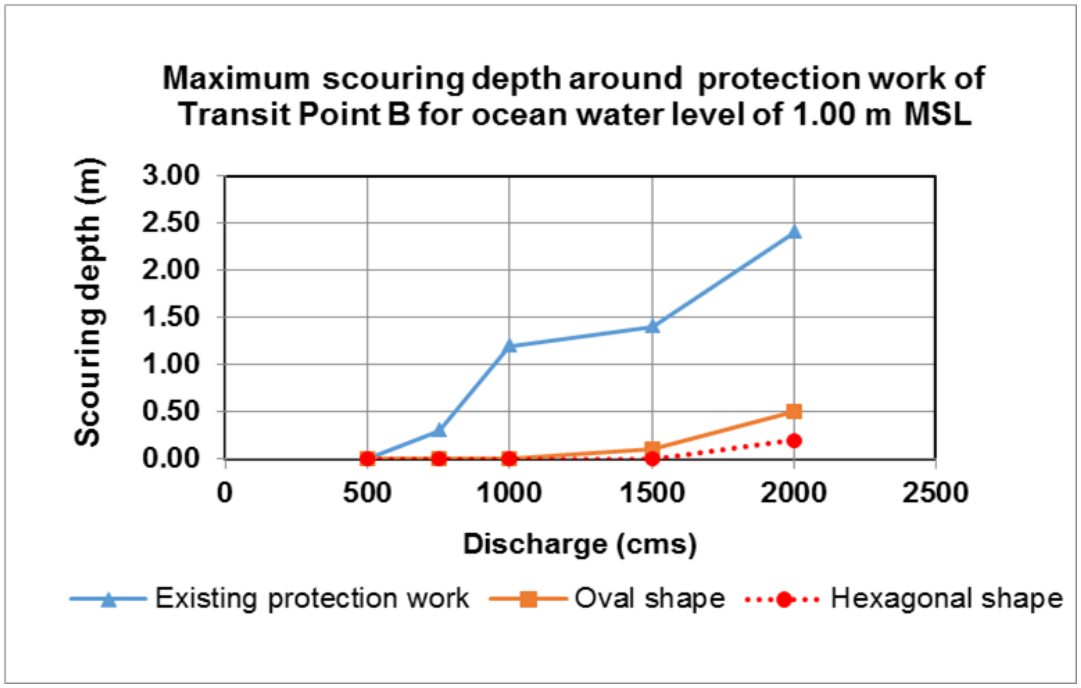
| | | |
|---|---|---|
| **Q = 500 CMS** |  |  |
| **Q = 750 CMS** |  |  |
| **Q = 1000 CMS** |  |  |

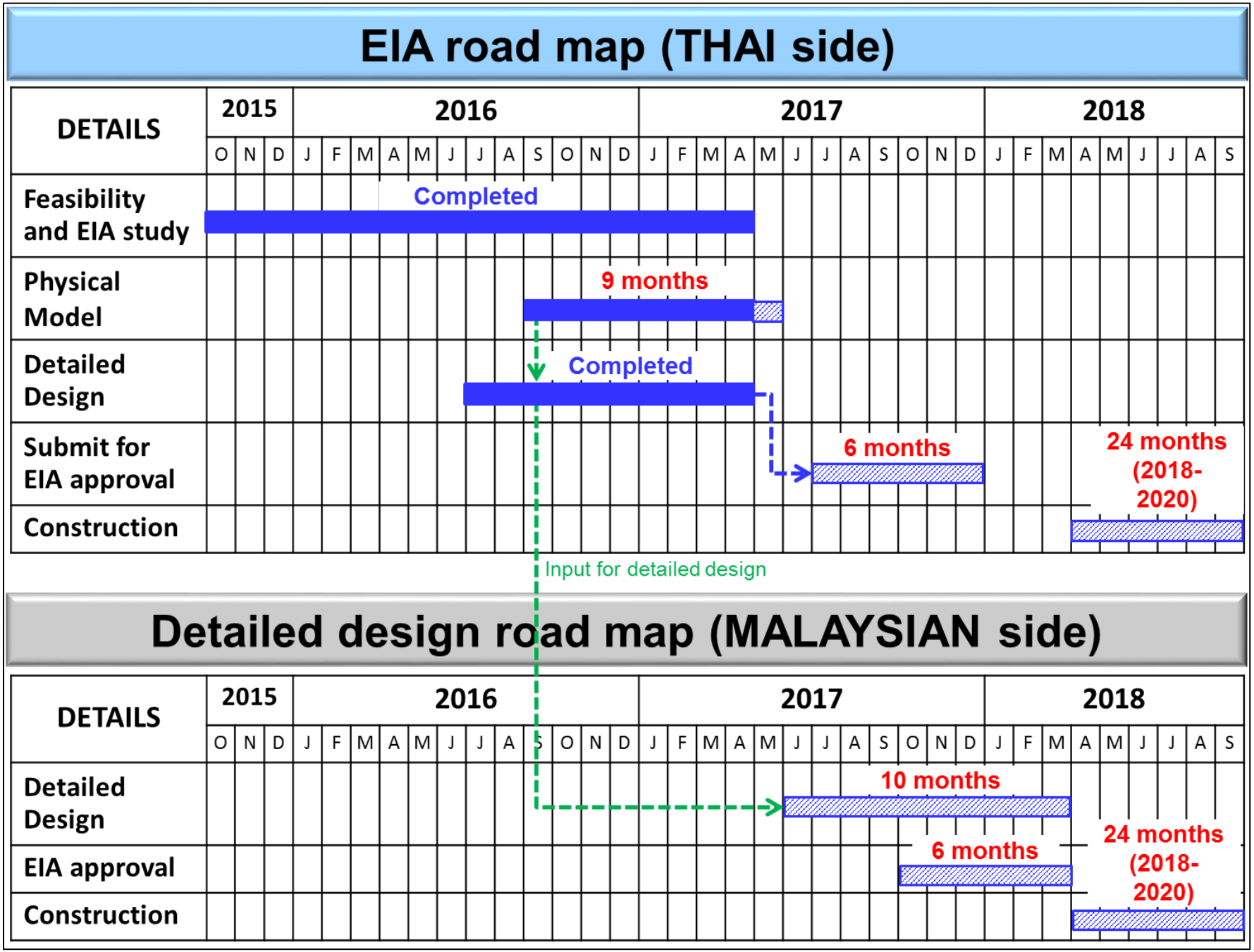
| | | |
|---|---|---|
| **Q = 1500 CMS** |  |  |
| **Q = 2000 CMS** |  |  |


Headloss through protection work of Transit Point B
for ocean water level of 0.00 m MSL
Headloss (m)
0.50
0.40
0.30
0.20
0.10
0.00
0
500
1000
1500
2000
2500
Discharge (cms)
Existing protection work
Oval shape
Hexagonal shape


Headloss through protection work of Transit Point B
for ocean water level of 1.00 m MSL
Headloss (m)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
500
1000
1500
2000
2500
Discharge (cms)
Existing protection work
Oval shape
Hexagonal shape


Maximum scouring depth around protection work of Transit Point B for ocean water level of 0.00 m MSL
Scouring depth (m)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
500
1000
1500
2000
2500
Discharge (cms)
Existing protection work
Oval shape
Hexagonal shape

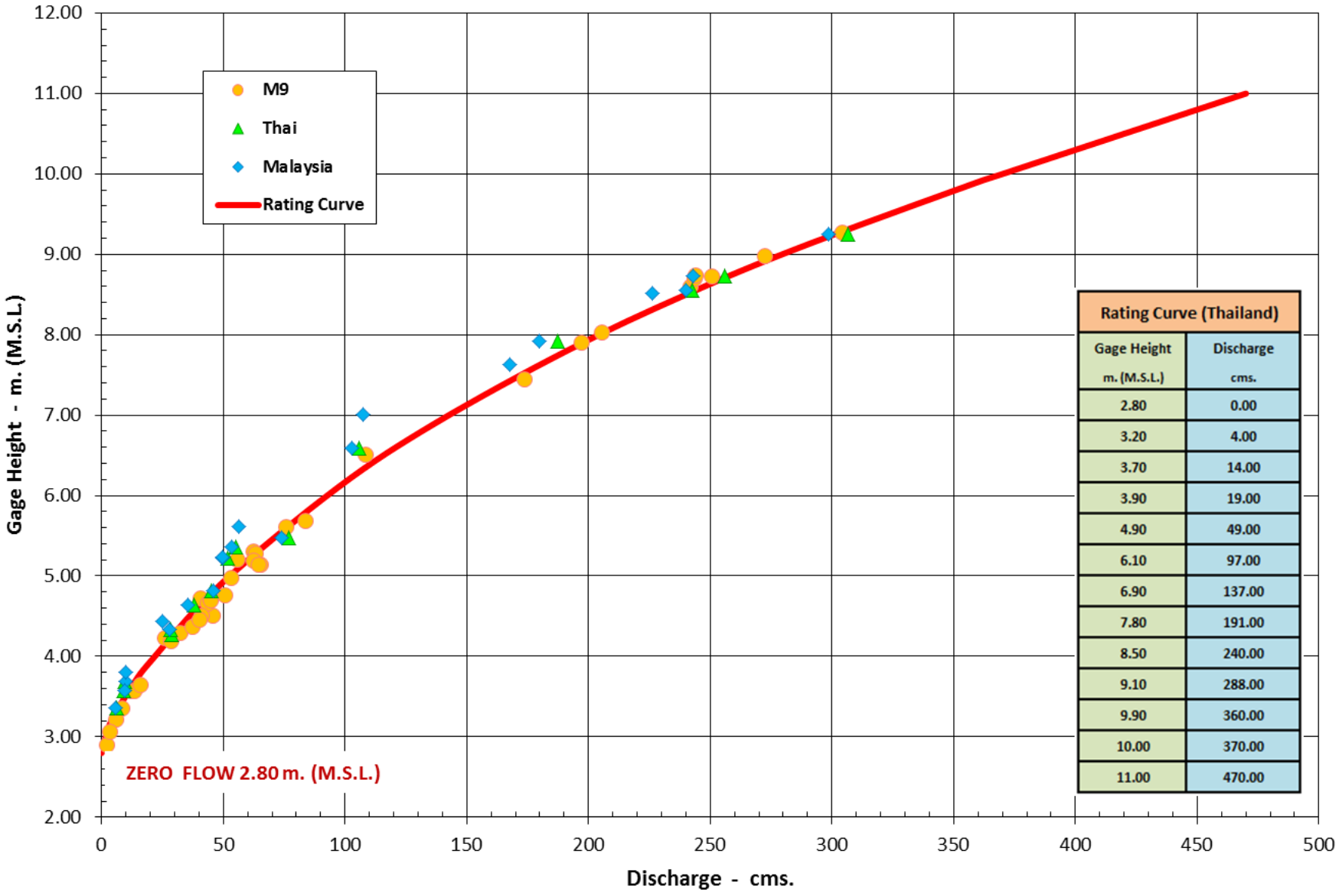

Maximum scouring depth around protection work of Transit Point B for ocean water level of 1.00 m MSL
Scouring depth (m)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
500
1000
1500
2000
2500
Discharge (cms)
Existing protection work
Oval shape
Hexagonal shape


EIA road map (THAI side)
DETAILS
2015
2016
2017
2018
O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S
Feasibility and EIA study
Completed
Physical Model
9 months
Detailed Design
Completed
Submit for EIA approval
6 months
24 months (2018-2020)
Construction
Input for detailed design
Detailed design road map (MALAYSIAN side)
DETAILS
2015
2016
2017
2018
O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S
Detailed Design
10 months
EIA approval
6 months
24 months (2018-2020)
Construction

| Mutual Gauging 2016 and 2017 | | | | |
|---|---|---|---|---|
| **Date** | **Level (m)** | **Discharge, Q (m3/s)** | **Area, A (m2)** | **Velocity, V (m/s)** |
| 28-Jan-16 (11am) | 7.63 | 168.507 | 224.15 | 0.752 |
| 28-Jan-16 (3pm) | 7.93 | 290.844 | 243.62 | 1.194 |
| 29-Feb-16 | 4.4 | 33.743 | 81.254 | 0.415 |
| 24-Mar-16 | 3.36 | 5.964 | 44.116 | 0.135 |
| 28-Apr-16 | 2.88 | 1.097 | 11.159 | 0.098 |
| 25-May-16 | 3.03 | 3.462 | 37.476 | 0.092 |
| 26-Jun-16 | 3.66 | 13.00 | 53.158 | 0.245 |
| 27-Jun-16 | 5.5 | 32.01 | 84.579 | 0.378 |
| 28-Jul-16 | 5.26 | 57.257 | 111.788 | 0.512 |
| 18-Aug-16 | 4.62 | 11.528 | 51.41 | 0.224 |
| 26-Sep-16 | 3.66 | 13.00 | 53.158 | 0.245 |
| 27-Oct-16 | 4.41 | 31.588 | 77.393 | 0.408 |
| 21-Nov-16 | 6.24 | 56.34 | 108.782 | 0.518 |
| 22-Dec-16 | 8.93 | 217.605 | 274.829 | 0.792 |
| 25-Jan-17 | 8.99 | 268.314 | 304.19 | 0.882 |
| 22-Feb-17 | 4.75 | 28.682 | 86.61 | 0.331 |
| 30-Mar-17 | 4.14 | 21.67 | 68.082 | 0.318 |

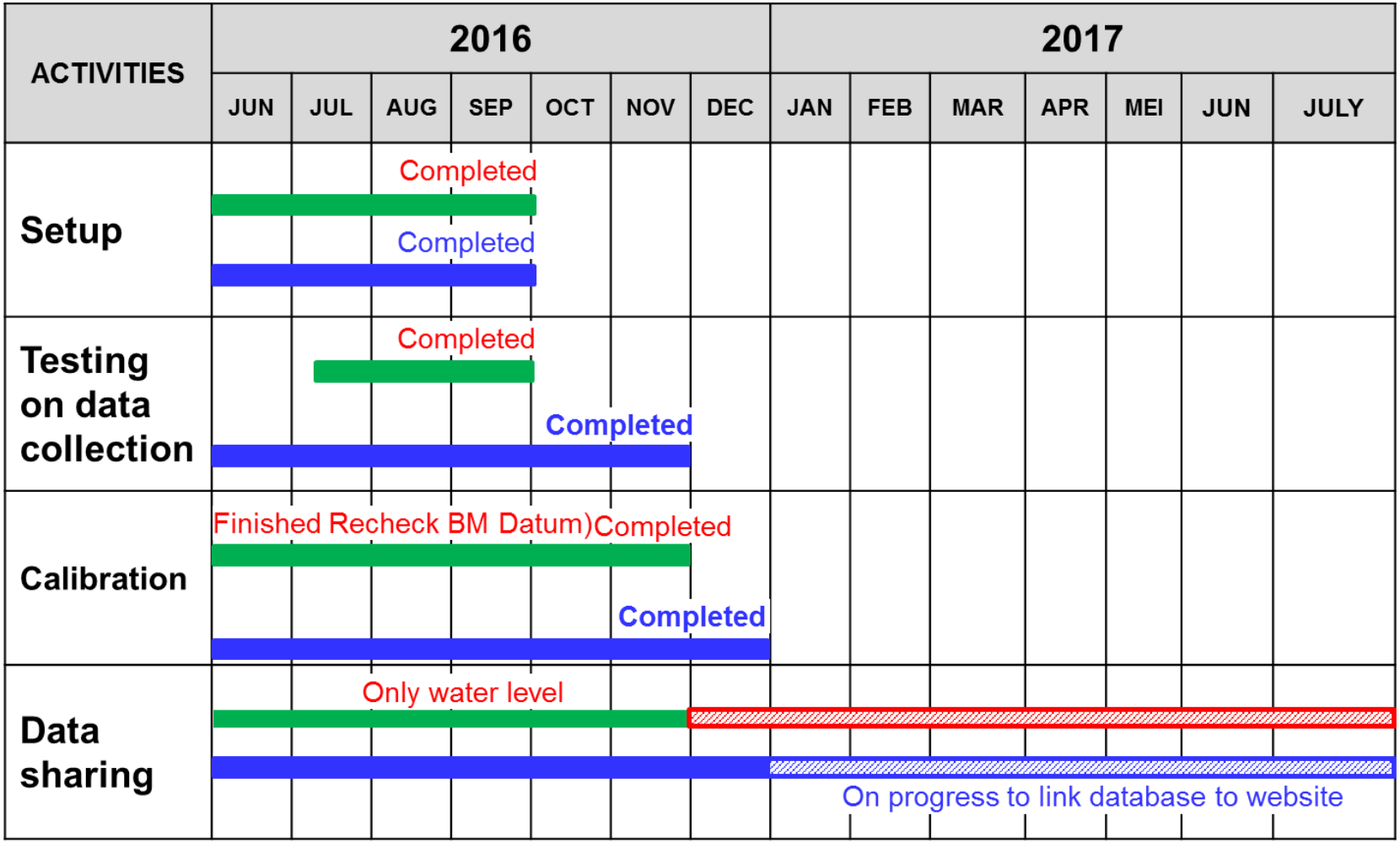
# MUTUAL RATING CURVE (WATER YEAR 2015-2016) AT STATION X.119A

## GOLOK RIVER AT BAN LAN-TU , SU-NGAI KOLOK , NARATHIWAT




| Rating Curve (Thailand) | |
|---|---|
| Gage Height m. (M.S.L.) | Discharge cms. |
| 2.80 | 0.00 |
| 3.20 | 4.00 |
| 3.70 | 14.00 |
| 3.90 | 19.00 |
| 4.90 | 49.00 |
| 6.10 | 97.00 |
| 6.90 | 137.00 |
| 7.80 | 191.00 |
| 8.50 | 240.00 |
| 9.10 | 288.00 |
| 9.90 | 360.00 |
| 10.00 | 370.00 |
| 11.00 | 470.00 |

# Progress of New Telemetry Station




Note:

Complete (Thailand)
Planning (Thailand)

Note:)

Progress (Malaysia)
Planning (Malaysia)

# Road Map for Joint Implementation Works