



### SALIENT FEATURES OF THE PROJECT

|                           |                                              |
|---------------------------|----------------------------------------------|
| NAME OF THE PROJECT:      | CONSTRUCTION OF KARNALI RIVER BRIDGE         |
| LOCATION:                 | KOTHIYAGHAT BARDIYA                          |
| LENGTH OF BRIDGE:         | 1015M                                        |
| FOUNDATION :              | WELL-20 NOS. DEPTH= 19-24M                   |
| SUB STRUCTURE:            | CIRCULAR PIER      SPAN LENGTH: 52.5M        |
| SUPERSTRUCTURE:           | PRE-STRESSED BOX GIRDER,CARRIAGEWAY WIDTH=7M |
| APPROACH ROAD:            | 1200 M                                       |
| RIVER TRAINING WORKS:     | 700 M                                        |
| TYPE OF CONTRACT:         | DESIGN AND BUILD                             |
| NAME OF THE CONTRACTOR:   | ANK/LUMBINI/TUNDI JV                         |
| CONTRACT AGREEMENT:       | ASHAD ,2067                                  |
| CONTRACT PERIOD:          | ASHAD, 2072                                  |
| CONSTRUCTION COST:        | NRs. 1270 MILLION                            |
| CONTRACT COMPLETION DATE: | BHADRA,2071                                  |

## LOCATION OF WELL-4

CONSTRUCTION OF WELL FOUNDATION  
WELL NO. 4

## DESIGN DETAIL :

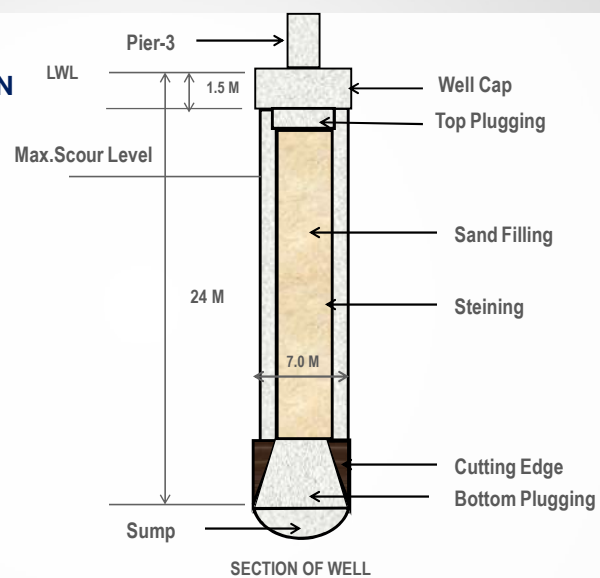
DEPTH=24M

DIA =7M

STENING THICKNESS= 1.15M

DEPTH OF WELL CAP=1.5 M

DEPTH OF CURB=2M



### CONSTRUCTION HISTORY OF WELL NO.4

•MAKING ISLAND  
START DATE:JAN,2011

•LAYING OF CUTTING EDGE  
DATE: FEBRUARY,2011



### CONSTRUCTION OF WELL FOUNDATION WELL NO.3, 4 , 5 AND 6

Construction of well started at the same time in well 3,4,5 and 6 with 2 cranes

Progress of well sinking during Feb-June, 2011

Well 3=18 m

Well 4=20m

Well 5=16m

Well 6=14 m

No further work was possible during monsoon(July-September)





CONSTRUCTION OF WELL FOUNDATION 3, 4 , 5 AND 6

#### CONSTRUCTION OF FOUNDATION WELL NO. 4

After monsoon well sinking operation resumed on well no 4 continuously engaging one crane till june,2012. No well movement was found.

However, well construction was completed on well no.2,3,5,6,7,8 and 9 including sub structures.

The contractor was advised to continue the foundation work with some risk on well no 10 -16 during monsoon period too, where the area gets flooded only if there is heavy rain.



## SINKING ON WELL-4

Efforts made during jan-june, 2012

- Continuous dredging
- Pumping out
- Inspection by divers below cutting edge
- Jetting

Result:

Still no movement

Overall progress:

- Completion of all Wells except well-4
- 14 substructures
- 6 superstructures

Overall progress was well ahead with the schedule



PROGRESS TILL JUNE 2012

Sinking of well resumed after monsoon of 2012 and continued till Jan, 2013 with several subcontractors including the one who had lot of experiences on such cases including Ganga river bridge, India. He tried his best to resolve the issue. He worked for 4 days on this without any success.

The overall Progress by that time was encouraging since the overall Progress was well ahead of the Schedule. 19 foundations were already completed including the Completion of 11 superstructures out of 19.



PROGRESS TILL JAN 2013

As all the options tried to solve the problem of Well No.4 for 2 years without any success. Early resolution was necessary in order to complete the construction on time.

### Case Studies of the past on such Cases

After going through the several case studies on well sinking of several bridges in the past and Review of the literature, it was revealed that the well sinking gets interrupted on the following situations:

- **Wooden Logs**
- **Rock**
- **Loose sand/silt below stiff clayey layer**
- **Higher Frictional resistance of the soil**

Since there was no evidence of any Wooden logs, and the rock found below the cutting edge as per Diver and the Crane operator there could be the one reason among the last 2 situation mentioned above



Since, despite of the continuous dredging effort no sump was made below cutting edge, it was revealed that the most likely situation could be

- **Loose sand/silt below stiff clayey layer**

### Possible Reason:

Continuous Inflow of river bed material below the cutting edge which prevents the formation of Sump.

### Solution:

To increase the Hydraulic Pressure at the bottom of dredge hole than the pressure outside of the well.



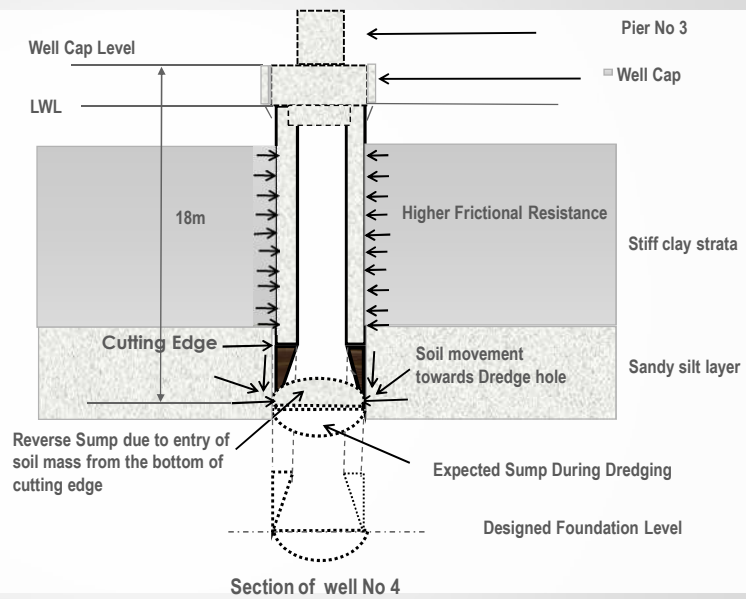
## INTERRUPTION DURING WELL SINKING OF WELL NO.4

### CAUSE:

- PRESENCE OF DIFFERENT LAYERS OF SOIL

### EFFECT:

- SINKING PROBLEM

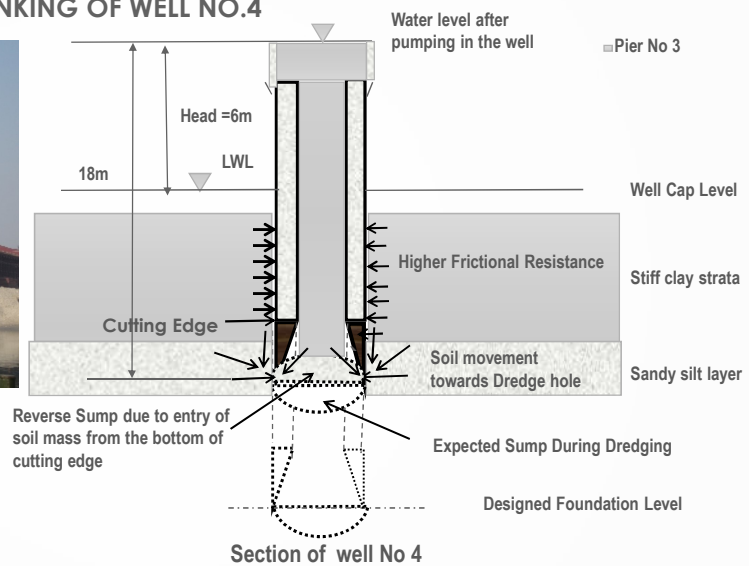


## INTERRUPTION DURING WELL SINKING OF WELL NO.4



### APPLIED SOLUTION:

- PUMPING IN THE WELL TO RAISE HEAD
- PRESSURE CREATED BY 6M HEAD
- BACK PRESSURE FROM BELOW THE CUTTING EDGE



**RESULT:**

Dredging continued day and night after pumped in the well and the following behavior were noticed at the end of :

Day 1 : no distinct sign noticed

Day 2 : hair line crack noticed between the outer surface of the well and the soil

Day 3 : widened crack noticed but still sinking was not achieved.

**Indication:**

Widened crack hinted that there is considerable movement that caused widened cracks on a well which remained stationary for a long time.

We, the whole team returned to camp with the hope of better tomorrow. We were delighted with the believe that we surely need level machine and a level book tomorrow.



As anticipated in day 3, well sinking was achieved from day 4 and well sinking was completed on day-17. Record of well sinking was as under:

| DAY   | DATE       | SINKING IN CM | TOTAL |
|-------|------------|---------------|-------|
| 4     | 24/01/2013 | 03            | 03    |
| 5     | 25/01/2013 | 12            | 15    |
| 6     | 26/01/2013 | 42            | 57    |
| 7     | 27/01/2013 | 39            | 96    |
| 8     | 28/01/2013 | 62            | 158   |
| 9     | 29/01/2013 | 64            | 222   |
| 10    | 30/01/2013 | 76            | 298   |
| 11    | 31/01/2013 | 80            | 378   |
| 12    | 01/02/2013 | 55            | 433   |
| 13    | 02/02/2013 | 60            | 493   |
| 14    | 03/02/2013 | 48            | 541   |
| 15    | 04/02/2013 | 44            | 585   |
| 16    | 05/02/2013 | 08            | 593   |
| 17    | 06/02/2013 | 07            | 600   |
| Total |            |               | 600   |



WELL BEFORE PUMPING IN



COMPLETION OF WELL SINKING

## PROGRESS OF WELL-4

SUB STRUCTURE UNDER  
CONSTRUCTION

APRIL, 2013

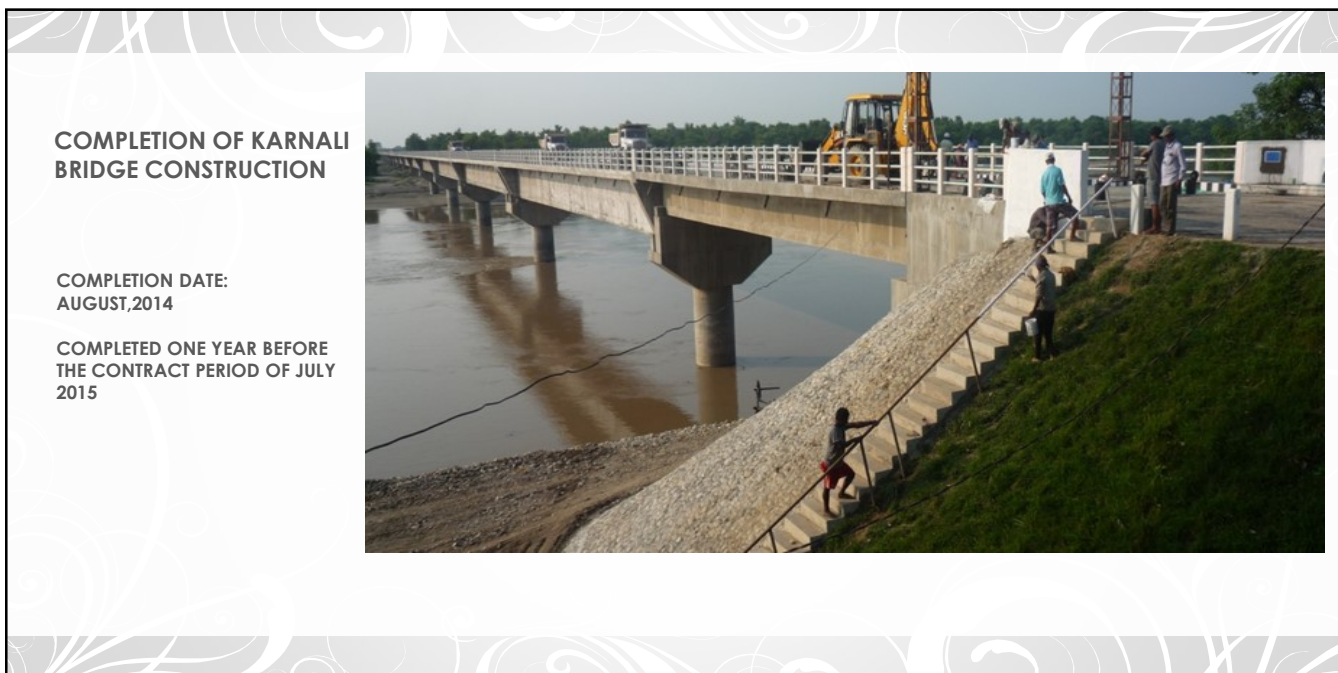


## PROGRESS OF WELL-4

COMPLETION OF SUB  
STRUCTURE

APRIL, 2013





**Thank You**