

Report of the Joint Committee constituted by Hon'ble NGT as per Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery, in Compliance of Hon'ble NGT Order dated 10.05.2019.

During the hearing of the case OA No. 738/2018 titled Satpal Singh and Others Vs Indian Oil Corporation Limited, Panipat Refinery before Hon'ble NGT on 01.03.2019, the following directions were issued by the Hon'ble Tribunal.

*"In the light of findings recorded in the spot inspection report, we consider it necessary to require the **Joint Committee constituted by this Tribunal vide order dated 15.11.2018** to make a realistic assessment of the damage caused to public health and environment and immediate measures for stoppage of polluting activity. Such report may be furnished within one month by email at [ngt.filing@gmail.com](mailto:ngt.filing@gmail.com). The Committee is at liberty to take any expert opinion or co-opt any other expert. The compensation proposed must be adequate to meet the cost of restoration of environment and public health and deterrent against the polluter so that such action is not repeated".*

Accordingly, interim report of the joint committee constituted by Hon'ble NGT as per order dated 15/11/2018 in the referred O.A. No.738/2018 was filed before the Hon'ble Tribunal on 09/05/2019 with interim compensation of Rs.17.31 Crore on IOCL, Panipat Refinery. Hon'ble NGT passed order on 10/05/2019 considering the report of joint committee. The operative part of the said order is as under.

*"We direct that a sum of Rs.17.31 Crore assessed by the committee may be deposited by the unit within one month from today with CPCB by way of interim compensation for restoration of environment subject to the further orders. Further action may be taken by the HSPCB in accordance of law and a report filed to this Tribunal by e-mail at [ngt.filing@gmail.com](mailto:ngt.filing@gmail.com). The committee may also furnish its final report before next date with a copy to respondent No.1 preferably a week in advance so that respondent No. 1 can respond the same".*



In compliance of the order dated 10.05.2019 the respondent no. 1 i.e M/s. Indian Oil Corporation, Panipat Refinery, Panipat has deposited the interim compensation of Rs.17.31 Cr to CPCB.

As decided by the Joint Committee the work for assessment of the damage and cost of restoration was divided into three components and the same was assigned to CPCB Member and the co-opted experts from CSIR-NEERI and CGWB as per details given below.

1. Assessment of damage and cost of restoration with respect to Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent (CPCB Member).
2. Assessment of damage caused to public health & environment (Expert from CSIR-NEERI ).
3. Assessment of damage caused to ground water and cost of restoration (Expert from CGWB).

As per the allocation of the above mentioned work of assessment of the damage and cost of restoration, the joint committee received the respective reports as per following details.

- a) CPCB member submitted his report on assessment of damage and cost of restoration with respect to Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent on dated 09.08.2019 (**Annexure-A**).
- b) Expert from CSIR-NEERI submitted his report on assessment of damage caused to public health & environment on dated 02.08.2019 (**Annexure-B**).
- c) Expert from CGWB submitted his report on assessment of damage caused to ground water and cost of restoration on dated 08.08.2019 and subsequent modified report on 05.09.2019 (**Annexure-C1 & C2**).

After receipt of the above said reports, the meeting of the Joint Committee was held on 20.09.2019. A need was expressed in the meeting by the Deputy Commissioner, Panipat, one of the Members of the Committee, for technical expertise and assistance to understand and comprehend fully the concepts and ramifications of the various reports submitted by individual members with respect to damage assessment and cost of restoration of different components. She therefore requested that more time be provided

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for this purpose. Accordingly, an application was filed before the Hon'ble NGT and simultaneously the Deputy Commissioner engaged M/s Engineers India Limited (EIL) for giving expert advice in order to understand the technicalities of the reports submitted by the CPCB, CSIR-NEERI and CGWB.

Another meeting of the Joint Committee and experts co-opted in this matter along with representative from M/s Engineers India Limited was held on 15.11.2019 to discuss various reports including the report of M/s Engineers India Limited.

The reply received by Representative Member of the Central Pollution Control Board vide e mail dated 20.11.2019 is annexed at **Annexure D**. Further, the reply submitted by the Deputy Commissioner vide letter dated 20.11.2019 is also annexed as **Annexure E**. HSPCB Member's views are annexed as **Annexure F**.

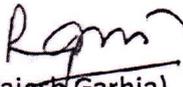
Broadly, some significantly persistent issues have been raised individually by the Members of the Joint Committee which need to be reviewed and carefully reassessed before presenting the final picture before the Hon'ble Tribunal. Some of these include the following:

1. CPCB Member has assessed the compensation towards the damages relating to discharge of effluent and doubled the actual cost of damage as a deterrent factor. However there is no specific justification for such doubling provided.
2. CSIR-NEERI has assessed the environmental compensation due to the environment damage by way of discharge of effluent by considering 506 days as violation period whereas CPCB Member has calculated the same for 120 days. Now, this is also not uniformly adopted by all technical agencies and therefore requires a clarity on the same for uniformity.
3. The component of environmental compensation relating to discharge of effluent indicated by CPCB Member has also been included by CSIR - NEERI Member also in his report, thereby duplicating the same. It has also been observed though the compensation has been worked out for the same cause, the amount is not the same, differing considerably. Therefore this also needs to be revisited.
4. The assessment of CSIR-NEERI on the environmental compensation due to the damage done on the health of the people in the area may again need to be re-examined since the expert himself was unsure of all the

- other sources of pollutants, but assumed that all the reported air borne diseases to be the result of pollutants emitted from PRPC stacks of the unit. Further, the calculation of cost on health damage has been computed from the year 2015 but no specific justification has been provided for the same.
5. CGWB assessment also requires to be re examined since the expert who has taken a study area of more than 70 sq km, has proposed for withdrawal of aquifers and refilling of the same, the process of which has to be studied for its feasibility at ground level. Further, the quantum and proportion of actual damage caused by IOCL *vis-a-vis* other industrial and agriculture activities have not been clearly brought out in the report.

It is therefore proposed that a careful re-verification exercise may be carried out by engaging a reputed third party agency by the Joint Committee to resolve the contentious issues which are confronting the Committee. The Committee is in the process of the same and requests the Hon'ble Tribunal to allow this Committee a time period of three months for the same so that a just and rational solution can be worked out and submitted to the Hon'ble NGT.

The Joint Committee is committed to abide by all the further directions of Hon'ble NGT in this matter.

  
(Rajesh Garhia)  
Senior Scientist, HSPCB

(Dr Narender Sharma)  
Additional Director, CPCB

  
(Ms. Sumedha Kataria, IAS)  
DC, Panipat

Date: 23.11.2019

## Comments on the Draft report circulated by Nodal Officer, HSPCB, for finalizing the Report

**A. The damage and cost of restoration w.r.t Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent submitted to Hon'ble NGT by two members earlier in the interim report needs to be updated as explained earlier, to make it technically and legally correct , if challenged. Pls note no change has been made in the number of days i.e 120 days as decided by two members of the committee for interim reports. Only correction has been made in one formula and unit price of one component has been updated citing Reference. Therefore, it is requested to include the following details appropriately in the final report.**

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Responsibility of assessment of damage and cost of restoration was assigned by the Joint Committee as under:

- 1. Assessment of damage and cost of restoration w.r.t Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent (CPCB Member)**
- 2. Assessment of damage caused to public health & environment (CSIR-NEERI Member)**
- 3. Assessment of damage caused to ground water and cost of restoration (CGWB Member)**

### **1. Assessment of damage and cost of restoration w.r.t Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent:**

The tentative cost of restoration towards the damage caused w.r.t Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent, as submitted to Hon'ble NGT in the Interim Report by two members of the committee was Rs. 17.31Crores. Since some of the numbers considered while calculating the tentative cost of restoration earlier were estimated figures and it was also observed that minor correction was also required in a formula used for calculation, CPCB member revisited the assessment done earlier and the updated assessment of the damage and cost of restoration w.r.t oxygen depletion and pollution caused to the surface water due to illegal discharge of effluent, after incorporating the references used for arriving at the final figure, is submitted before the Hon'ble NGT as under:

### **Environmental Damage due to Illegal Discharge of BOD:**

The environmental Damage on account of oxygen depletion due to illegal discharge of BOD into the Thirana Drain from PTA Plant, as calculated by the Joint Committee is as follows:

Total Volume of Effluent from PTA Plant through ETP-III **(A)**: 255 m<sup>3</sup>/h i.e. 255 x 24: 6120 m<sup>3</sup>/day

Biochemical Oxygen Demand (BOD) of the Effluent **(B)**: 170 mg/l i.e. 0.17 Kg/m<sup>3</sup>

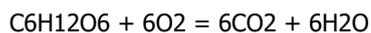
Total BOD discharged in the Thirana Drain/day **(C)**: A x B: 6120 x 0.17 = 1040.40 Kg/day

Total Period of Non Compliance as decided by two members of the Committee **(D)**: 120 days

Total BOD discharged in the Thirana Drain during entire period of non-Compliance **(E)**: C x

D: 1040.40 x 120 = 124848 Kg

Amount of Oxygen required for stabilizing BOD **(F)**:



Thus, the theoretical oxygen demand would then be:

Oxygen demand = (Gram of oxygen used) / (Gram of carbon oxidized) =

$$192 / 72 = 2.67 \text{ g } O_2/\text{g of carbon}$$

Total Oxygen required to stabilize total BOD Load discharged in the Thirana Drain **(G)**: E x F i.e. 124848 x 2.67 = **333344.16 Kg**

Estimated Cost of Oxygen **(H)**: Rs. 25/ Kg.

**Total Environmental Damage in Monetary terms due to depletion of Oxygen on account of illegal discharge of Effluent in the Thirana Drain: G x H i.e. 333344.16 x 25 = Rs 8333604 (C1)**

### **Environmental Damage due to Illegal Discharge of COD:**

The BOD discharge calculated above is the BOD<sub>3</sub> estimated in the laboratory, in the samples collected by the Joint Committee. However, BOD<sub>5</sub> is only 60% of the Ultimate BOD i.e BOD<sub>20</sub>, and the remaining 40% of the BOD ( i.e difference of BOD<sub>20</sub> and BOD<sub>3</sub>) which is although biodegradable but not reflected in the BOD<sub>3</sub> tests conducted in the laboratory, contributes towards COD. This 40% of the BOD, which is reflected as COD, also depletes oxygen when discharged in the Environment. Therefore, Joint Committee decided to estimate the damage caused to the environment due to this biodegradable component of the COD as follows:

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BOD<sub>3</sub> of the effluent discharged in the Thirana Drain (A): 170 mg/l

(This BOD<sub>3</sub> is the only 60% of the Ultimate BOD i.e BOD<sub>20</sub>)

Remaining 40% portion of the BOD which is reflected as COD:  $(100/60 \times A) - A$  i.e  $(100/60 \times 170) - 170 = 113$  mg/l i.e 0.113 Kg BOD /m<sup>3</sup>

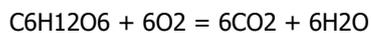
Total Volume of Effluent from PTA Plant through ETP-III (A): 255 m<sup>3</sup>/h i.e. 255 x 24: 6120 m<sup>3</sup>/day

Total Biodegradable COD (Difference of BOD<sub>20</sub> and BOD<sub>3</sub>) discharged in the Thirana Drain/day (C):  $A \times B$ : 6120 x 0.113 = 691.56 Kg/day

Total Period of Non Compliance as decided by two members of the committee(D): 120 days

Total BOD discharged in the Thirana Drain during entire period of non-Compliance (E):  $C \times D$ : 691.56 x 120 = 82987.2Kg

Amount of Oxygen required for stabilizing BOD (F):



Thus, the theoretical oxygen demand would then be:

Oxygen demand = (Gram of oxygen used) / (Gram of carbon oxidized) =

$$192 / 72 = 2.67 \text{ g } O_2/\text{g of carbon}$$

Total Oxygen required to stabilize total BOD Load discharged in the Thirana Drain (G):  $E \times F$  i.e. 82987.2 x 2.67 = **221575.82 Kg**

Estimated Cost of Oxygen (H): Rs. 25/ Kg.

**Total Environmental Damage in Monetary terms due to depletion of Oxygen on account of illegal discharge of Effluent in the Thirana Drain:  $G \times H$  i.e.  $221575.82 \times 25 = \text{Rs } 5539395$  (C2)**

### **Environmental Damage due to Discharge of Untreated Effluent in Cess Pool:**

The untreated effluents was found to be discharged in an area measuring 250 mtr x 8 mtr. The environmental damage on account of this activity was calculated as follows:

Average BOD of the Untreated Effluent in Cess Pool as reported earlier in the report of the Joint Committee (A): 1050 mg/l i.e 1.5 Kg/m<sup>3</sup>

Total Volume of Effluent in Cess Pool as per Report of the Joint Committee (B): 250 x 8 x 2.5 mtr=5000 m<sup>3</sup>

Total BOD Discharged (C):  $A \times B$  i.e. 1.5 x 5000 = 7500 Kg

Oxygen required to stabilize BOD: 2.67 g O<sub>2</sub>/ g of carbon

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Total Oxygen required to stabilize total BOD Load discharged in Cess Pool:  $7500 \times 2.6 =$   
**19500 Kg**

Estimated Cost of Oxygen: Rs. 25 /Kg

**Total Environmental Damage in Monetary terms due to depletion of Oxygen on account of illegal discharge of Effluent in the Cess Pool:  $19500 \times 25 =$  Rs. 487500 (C3)**

Total Cost of Environmental Damage by IOCL, Panipat Refinery: C1 + C2 + C3 i.e. **Rs 8333604+ Rs. 5539395 + Rs. 487500 = Rs. 14360499 (Rs. 1.44 Crores)**

**Cost of Restoration of the Environment damage on account of Oxygen depletion:**

Joint Committee was of the view that a part of the Environmental damage caused due to depletion of Oxygen may be restored by generating equivalent amount of oxygen through tree plantation. In view of this, the Joint Committee calculated the cost of restoration of Environment as follows:

Amount of Oxygen depleted by Discharging untreated effluent (BOD) in Thirana Drain:  
**333344.16 Kg**

Amount of Oxygen depleted by Discharging untreated effluent (BOD) in Thirana Drain:  
**221575.82 Kg**

Amount of Oxygen depleted by Discharging untreated effluent in Cess Pool: **19500 Kg**

**Total Amount of Oxygen depleted (A):  $333344.16 + 221575.82 + 19500 = 574419.98$  Kg O<sub>2</sub>**

Average amount of Oxygen generated by a fully grown tree/annum (B): 118 Kg

Total Number of Forest trees required to generate depleted Oxygen (C):  $A/B: 574419.98 / 118 = 4868$  Trees

Survival rate of the Forest Trees (D): 60%

Total number of trees required after considering 60% survival rate (E):  $100/D \times C$  i.e.  $100/60 \times 4868 = 8113$  Trees

Average Time required for maturity of Forest Trees (F): 10 years

Total Number of Trees considering maturity Period (G):  $E \times F$  i.e.  $8113 \times 10 = 81130$  trees

The joint committee is of the view that the damaged caused by the Unit in four months should be restored in seven months to ensure timely justice to the environment.

**Number of Trees required for Restoration of Damage in 4 months (H):  $G \times (12/7)$   
i.e.  $81130 \times 12/4 = 243390$  Trees**

Estimated average price of 6-8 Ft Forest Tree (**I**): Rs. 100 (Reference: India Mart. The price was found to be ranging between Rs. 50-250/Tree)

**Total Cost of Restoration:  $H \times I: 243390 \times 100 = \text{Rs. } 24339000$  (Rs. 2.43 Crores)**

This cost of restoration is just enough to restore the damage caused by the Unit by depleting the Oxygen from the Environment. As directed by Hon'ble NGT, it is extremely necessary to make this deterrent so that such acts of polluting the environment are not repeated in the future. **Therefore, Joint Committee proposes to impose Environmental Damage cost equivalent to 2 times of the Cost of Restoration.**

**Therefore, the proposed cost of Restoration should be:  $\text{Rs. } 2.43 \text{ Crores} \times 2 = 4.86 \text{ Crores (C4)}$**

**Cost of Damage due to Discharge of TDS in Thirana Drain and Compensation:**

The Industry is not permitted to discharge effluent in the Thirana Drain. Apart from discharging high BOD, the Unit has also been discharging high TDS in the Thirana Drain instead of recycling and reusing the effluent as per conditions of the Consent granted by Haryana State Pollution Control Board. *Joint Committee was of the view that by Discharging TDS in the Thirana drain, Industry has tried to save the treatment cost and hence in this case, Environmental compensation should be equivalent to atleast Cost of Prevention, which may be utilized for monitoring and planning of restoration of ground water quality. The cost of prevention estimated by the Joint Committee is as under:*

Total Volume of Effluent from PTA Plant through ETP-III (**A**): 255 m<sup>3</sup>/h i.e. 255 x 24: 6120 m<sup>3</sup>/day

Total period of Non Compliance as decided by two members of the Committee (**B**): 120 days

Estimated minimum cost of Treatment (Including partial ZLD) for recycling the effluent (**C**): **Rs 150/m<sup>3</sup>** (Reference: CPCB Guidelines on Techno-Economic Feasibility of Implementation of Zero Liquid

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Discharge (ZLD) for Water Polluting Industries . The O&M cost of ZLD Indicated in the Guidelines if Rs. 300-350 for ZLD. Since the consent of operate granted to the Unit is for "Recycle and Reuse", the cost of ZLD taken by Joint Committee is Rs. 150/m<sup>3</sup> )

**Total Cost of Prevention: A x B x C i.e. 6120 x 150 x 120 = Rs. 110160000 (Rs. 11.02 Crores )**

*Joint Committee is of the view that keeping the cost of restoration just equivalent to the cost of prevention may not serve as a deterrent for preventing the Unit to do such act of non-compliance of the conditions of Consent to operate granted by HSPCB and hence keeping in view the fact the unit has remained non-compliant for more than 6 months, it is proposed to impose Environmental Restoration Cost equivalent to 2 times of cost of prevention.*

**Therefore, the proposed cost of Restoration should be: 11.02 x 2 = Rs. 22.04 Crores (C5)**

**So, Total cost of restoration on account of damage caused due to oxygen depletion and pollution of surface water: C4 + C5 i.e 4.86+ 22.04 = Rs. 26.90 Crores**

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#### **B. The following may also be incorporated in the Conclusion Section**

The environmental compensation (EC) calculated by the Joint team is as under:

- i) EC for Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent: **Rs. 26.90 Crores**
- ii) EC for damage caused to public health & environment : **Rs. 92.59 Crores**
- iii) EC on account of damage caused to ground water : **Rs. 540 Crores**

***Total Environmental Compensation as calculated by the Joint team is : 26.90 + 92.59 + 540 = Rs. 659.49 Crores, out of which IOCL has already deposited Rs. 17.31 Crores, as interim compensation in compliance of Hon'ble NGT Order.***

***Therefore, balance environmental compensation to be deposited is: 659.49-17.31 = Rs. 642.18 Crores, if approved by Hon'ble NGT.***

Water stored in multiple lagoons/ponds inside the plant should be treated and recycled before lining the lagoon to make them impervious.

No untreated water will be stored in the lagoons/ponds except in the tanks, which are components of effluent treatment plant.

Looking into the potential of one industry to cause such a huge environmental damage, the Joint Committee is of the view that mode of discharge of treated industrial effluents must be decided and permitted only and only after evaluating the carrying capacity of receiving environment. This factor becomes extremely important in view of the fact that the cost & time required for restoration is much higher than the cost of damage & period of polluting activity and the damage caused to the environment may not be reversible in most of the cases.

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**C. Pls also note that the following statements were submitted by two members in the interim report:**

“The profit made by the PTA plant per day can be calculated only after submission of profit earned by the unit from its PTA plant. This information was requested by the Joint Committee from the Unit on 27/03/2019 and is yet to be received.”

“ The unit may be directed to submit the amount of profit earned by him per day from the PTA Plant, so that total amount of profit earned by the unit from the production made without complying with the environmental norms could be calculated during non-compliance period”

“However, once the assessment of environmental damage to public health and Ground water is concluded with the assistance of Co-opted Experts and the details of the profits earned by the Unit from the production made by violating the environmental norms, the Joint Committee may further enhance the deterrent effect for continuous and long term violations made by the unit by proposing the Cost of Restoration/Environmental Compensation on exponential basis”

**You may like to add something w.r.t above in the Final Report, to avoid any adverse observation by the Court.**

**Environmental damage cost assessment due to discharge pollutants from effluent treatment plant beyond the permissible limits into Thirana drain by IOCL Refinery, Panipat and cess pool**

The Effluent from IOCL refinery, Panipat was found to be discharged beyond the CPCB prescribed standards into storm drains and open land. The discharge of polluted effluent into thirana drain ultimately reaches river Yamuna causing environmental oriented damages such as the depletion of aquatic life, water supply suspension, toxicity, damage to biological life etc. Pollutant discharged into open land has resulted in ground water contamination and disamenity due to odor due to stagnation of the effluent for a longer period forming a cess pool. This illicit exploitation and significant damages to the environment are valued on a monetary basis in this report. The monetary assessment was carried out using shadow pricing method using the figures in table 1. Shadow pricing or avoided cost refers to those damage cost that can be avoided if efficient treatment procedure is incorporated to reduce the pollutant Concentration before the final discharge.

**Table 1: Damage cost value for each pollutant [1]**

<b>Pollutant</b>	<b>Damage in Euro per Kg (2010)</b>
Suspended Solids	0.005
Biological Oxygen Demand	0.033
Chemical Oxygen Demand	0.098

Economic assessment cost on the environment due to the discharge of pollutant is calculated taking CPCB discharge standards as base document [2]. The breached pollutant load in comparison with CPCB permissible limit is considered for analysis and damage cost for a non-complying period of 506 days was calculated using the figures suggested by [1]. The estimation of damage cost is done on 2010 - 2019 average inflation basis i.e., 78.30% [3] and Euro to INR exchange rate for the year 2010 (1 Euro = 60.59) [4].

Table 2 shows the pollutant concentration of effluent being discharged. It can be observed that all the discharge pollutant concentration breaches the standard set by CPCB for Petroleum oil refinery industries. Table 3 shows the non-complying duration for the effluent discharge. IOCL operates 3 Effluent treatment plants. The capacity of ETP's are ETP-1 & ETP-2 is 400 m<sup>3</sup>/hr each and that of ETP-3 is 275 m<sup>3</sup>/hr. The treated effluents from ETP-1 & ETP-2 is taken directly into the process and treated effluent from ETP-3 is discharged into thirana drain.



**Table 2: Concentration of pollutants discharged into Thirana drain and cess pool**

Pollutants	Discharge concentration in Thirana drain (mg/l)	Discharge concentration in open land/cess pool (mg/l)	CPCB discharge standard (mg/l) (EP,2008)
Biological oxygen demand (BOD)	170	1200	15
Chemical oxygen Demand (COD)	460	5472	125
Total suspended solids (TSS)	142[5]	552	20

**Table 3: Duration for which pollutants are emitted from ETP-III to Thirana drain**

From	To	Total Number of Days
13/11/2017	31/12/2017	49 days
1/1/2018	31/12/2018	365 days
1/1/2019	2/4/2019	92 days
<b>TOTAL</b>		<b>506 days</b>

**Table 4: Environmental damage cost due to Excess BOD discharge in Thirana drain**

Duration	BOD value of treated effluent being discharged (mg/l)	Excess BOD discharged breaching the standards (15 mg/l)	Damage cost (Lakhs, INR)
13-11-2017 to 31-12-2017	170	155	1.78
01-01-2017 to 31-12-2018	170	155	13.31
01-01-2019 to 02-04-2019	170	155	3.35
<b>Total</b>			<b>18.46 ---- (A)</b>

**Table 5: Environmental damage cost due to Excess COD discharge in Thirana drain**

Duration	COD value of treated effluent being discharged (mg/l)	Excess COD discharged breaching the standards (125 mg/l)	Damage cost (Lakhs, INR)
13-11-2017 to 31-12-2017	460	335	11.47
01-01-2017 to 31-12-2018	460	335	85.48

Environmental damage cost assessment due to discharge pollutants from effluent treatment plant beyond the permissible limits into Thirana drain by IOCL Refinery, Panipat and cess pool

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01-01-2019 to 02-04-2019	460	335	21.54
<b>Total</b>			<b>118.50 -- (B)</b>

**Table 6: Environmental damage cost due to Excess TSS discharge in Thirana drain**

Duration	COD value of treated effluent being discharged (mg/l)	Excess COD discharged breaching the standards (125 mg/l)	Damage cost (lakhs, INR)
13-11-2017	142	122	0.21
13-11-2017	142	122	1.58
13-11-2017	142	122	0.40
<b>Total</b>			<b>2.20 -- (C)</b>

Table 4,5,6 shows the environmental damage cost due to the discharge of pollutants such as Biological oxygen demand (BOD), Chemical oxygen demand (Cod) and total suspended solids (TSS) respectively at a concentration higher than the permissible value set by CPCB.

Therefore,

$$\begin{aligned}
 \text{Total environmental damage cost due to discharge into thirana drain} &= A+B+C \\
 &= 18,46,339 + 1,18,50,503 + 2,20,189 \\
 &= 1,39,17,032 \text{ INR (Rs. 1.39 Cr)} \\
 &\text{i.e. Rs 1 Crore in an year (2018)}
 \end{aligned}$$

Some of the water from the plant is directly discharged on land which has lead to creation of Cess Pool. The water quality analysis on the cess pool showed BOD: 102, 1200, 880,900 in mg/l, COD: 306, 3580, 2872, 5472in mg/l and TSS: 194, 124, 552, 252, 156 in mg/l[6]. As a purpose of valuation worst case scenario was considered, where higher concentration for each pollutants analysed was taken for assessment. The total volume of cess pool was 5000m<sup>3</sup>(250 x 8 x 2.5 mts)[6]and the same was used to calculate the loading rate, considering 2017 as discharge year. This cess pool water is stagnant in nature and must be percolating in the ground water. Since no direct valuation method is available to assess the environmental, damage, water risk monetiser is used to determine the damage value in the form of risk.

The idea used is to understand the amount of freshwater which will be required to dilute the water to attain water quality discharge standards.

**Table 6: Environmental damage cost due to direct discharge of effluent into cess pool**

Duration	Raw effluent parameters	Average Raw effluent concentration (mg/l)
13-11-2017	COD	3058
13-11-2017	BOD	770
13-11-2017	TSS	256

Direct discharge of raw effluent into open land has stagnated the effluent over the area forming a cess pool. The stagnated effluent in order to be discharged needs to meet the CPCB set standard (i.e., BOD = 15 mg/l). Hence a dilution with fresh water need to be made before the discharge. The fresh water required for dilution is 250 Million litres and is calculated using the Eq (1). The Cost for dilution is valued using willingness to pay method (WTP) which is considered as damage cost incurred due to release of raw effluent.

$$C_V \times C_{BOD} + D_V \times D_{BOD} = (C_V + D_V) \times F_{BOD} \quad \text{Eq (1)}$$

Where,

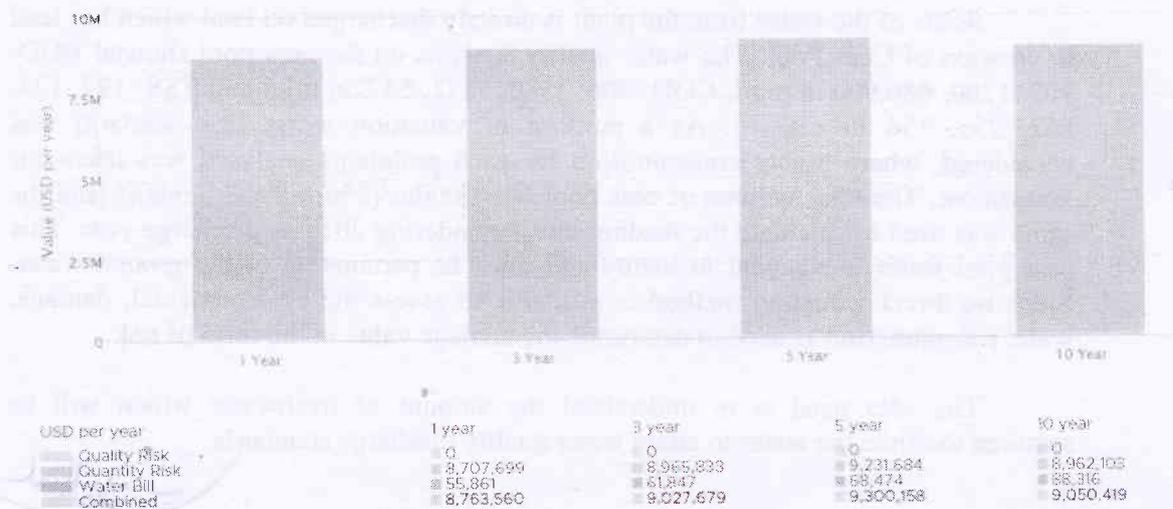
$C_V$  = Volume of cess pool (m<sup>3</sup>)

$C_{BOD}$  = BOD concentration in cess pool (mg/l)

$D_V$  = Volume of dilution water (m<sup>3</sup>)

$D_{BOD}$  = BOD of dilution water (mg/l) ( $D_{BOD}$  = 1 mg/l)

$F_{BOD}$  = Final BOD to be achieved (i.e., 15 mg/l)



The damage caused by cess pool water, when considered for discharge, will lead to an impact worth approximately Rs 59 Crore as given in the figure above. For USD to INR, Rs 68 is used as the conversion factor.

### Health damage cost due to air pollutants

Air pollutants emitted from industrial stacks can have severe adverse health impacts on human wellbeing. Major pollutants that need to be focused are PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub> & SO<sub>2</sub> as these have high risk of mortality and morbidity impacts on human. In this report, the data provided by Medical officer, CHC Daldana, Panipat regarding air borne cases as mentioned in Table 7 is used to evaluate health damage due to air pollutants. There exists an uncertainty, when it comes to source of pollutants that has resulted in air borne disease. In order to avoid the ambiguity, ambient air quality monitoring over the refinery area needs to be carried out. In this report, for the purpose of damage assessment, all the mentioned air borne cases are assumed to be due to pollutants emitted from industrial stack. This is based on the reason that respiratory problems generally happens because of air pollution. Further, there is hardly any other industry in the 10 km radius of CHC Daldana hence the air pollution can be attributed to only Panipat plants.

The damage cost due to air pollution is evaluated using cost of illness approach. The study carried out by [7] in Mumbai region is taken as reference document. The COI due to respiratory diseases is estimated for Panipat region considering the base estimate reported by [7] using per capita income of both cities as shown in Eq (2). The values are then inflated for the required years.

**Table 7: Water & air borne diseases details**

Year	Water borne diseases	Respiratory diseases
2015	198	1911
2016	60	2449
2017	436	505
2018	388	1157
2019	205	2495

$$COI_{Panipat} = COI_{Mumbai} \times \frac{Inc_{Panipat}}{Inc_{Mumbai}} \quad Eq$$

(2)

$COI_{Panipat}$  = Cost of illness per person in Panipat area

$COI_{Mumbai}$  = Cost of illness per person in Mumbai area (INR 14,378 as of 1997) [7]

$Inc_{Panipat}$  = Per capita income of Panipat for the year 2011-2012 (INR 109230) [8]

$Inc_{Mumbai}$  = Per capita income of Mumbai for the year 2011-2012 (INR 151608) [9]

COI<sub>Mumbai</sub> value is inflated to 2011, as no per capita income of both cities for the year 1997 was available. The inflated value is used to determine the COI<sub>Panipat</sub> for the year 2011 using Eq (2). Further the determined COI<sub>Panipat</sub> values are inflated for the required years. Total health damage cost incurred due to respiratory diseases as an impact of air pollutant is shown in Table 8. The total health damage cost incurred due to air pollution is 322.6 million INR (Rs. 32.2 Crore).

**Table 8: Health damage cost due to respiratory diseases**

Year	Cost per person (COI)	Total Cases	Total cost (INR)
2015	34546.12	1911	66017635
2016	36730.87	2449	89953900
2017	37550.12	505	18962810
2018	39052.14	1157	45183325
2019	41100.35	2495	102545373
Average (Rounded)			64532600 i.e. Rs. 6.45 Crore

Water damages are not valued as diseases can happen due to many reasons and cannot be directly attributed to Panipat plants.

Hence total impacts caused by the refinery is = 1.39 + 59 + 32.2 = Rs. 92.59 Crore

In an year, refinery has caused damage of = 1 + 6.45 + 59 (assuming all cess poll water is released in an year) = Rs. 66.45 Crore



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**Annexure-C1****Report on Environmental Compensation for Ground Water Contamination by Panipat Refinery as per Hon'ble NGT Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery in Compliance of Hon'ble NGT Order dated 01.03.2019**

During the hearing of the case OA No. 738/2018 titled Satpal Singh and Others Vs Indian Oil Corporation Limited, Panipat Refinery before Hon'ble NGT on 01.03.2019, the following directions were issued by the Hon'ble Tribunal:

*“In the light of findings recorded in the spot inspection report, we consider it necessary to require the **joint Committee constituted by this Tribunal vide order dated 15.11.2018** to make a realistic assessment of the damage caused to public health and environment and immediate measures for stoppage of polluting activity. Such report may be furnished within one month by email at [ngt.filing@gmail.com](mailto:ngt.filing@gmail.com). The Committee is at liberty to take any expert opinion or co-opt any other expert. The compensation proposed must be adequate to meet the cost of restoration of environment and public health and deterrent against the polluter so that such action is not repeated”.*

Accordingly, the committee constituted by Hon'ble NGT, co-opted a member from Central Ground Water Board for taking up ground water pollution studies around the Panipat Refiner to assess the areal impact of pollution caused by Panipat Refinery both laterally and vertically (Depth wise). Sh. S.K. Mohiddin, Sr. Hydro geologist, Central Ground Water Board (CGWB), North West Region, Chandigarh has been nominated by CGWB for this study.

CGWB has taken up the detailed study around the Refinery and collected 31 ground water samples around the Refinery to assess the ground water contamination. Groundwater sampling and analysis was done by Sh. Dhan Prakash, Sc 'B' CGWB during May and June, 2019. Apart from these 31 samples, the data collected by the

HSPCB during the preliminary study was also used for estimation of environmental compensation.

**2. Hydrogeological condition around the Panipat Refinery:** The Refinery is located adjacent to Western Yamuna Canal (Delhi Branch). The area is flat alluvial plain underlain by arid brown soil. The geological formation comprises unconsolidated alluvial deposits. The principal aquifer system comprises of fine to coarse sand and sand associated with kankar. A number of aquifers are present in the area as per the exploratory data of CGWB (CGWB data revealed that the existence of . The aquifer which is fine to coarse sand are intercalated with thin clay layers. It is observed that first sand layer is present from 10.00 m to 27.00 mts below ground level (bgl), second layer is present between 31.00 m to 35.00 m bgl, third layer present between 44.00 to 48.00 m bgl, fourth layer is between 82.5 m bgl and fourth layer is present between 95 to 130 m bgl. Within these aquifers also, there are few clay layers of 2-3 m thick which are not of much importance as far as hydrogeology is concerned because of lateral extension of these aquifers are very limited and the major aquifers are interconnected in the area. It is observed that most of the shallow tubewells are of the depth 30 m to 80 m depth with discharges varying between 8 to 14 Litres per Second (LPS). Depth to water level around the vicinity of Refinery and Western Yauna Canal is shallow i.e. 5.00 to 6.00 m bgl. Away from the canal, depth to water level is about 18.00 m to 20.00 m bgl. Piezometric head i.e. water level of deeper aquifer is also 18.32 m bgl in Baholi piezometer and 16.81 m bgl in Khandra.

**3. Ground Water Quality:**

Ground water samples from 31 shallow handpumps and deep tubewells are collected for analysis and data collected by HSPCB, Haryana, are also taken into consideration for demarcation of area of contamination. The data and interpretation along with the maps are at Annexure-1.

**4. Demarcation of Contaminated area:** A number of parameters are considered for demarcation of contaminated zone. Important parameters considered are Electrical Conductivity, COD and Iron Concentration. Based on the distribution of various parameters the contaminated zone has been demarcated. The E.C. value contour of 600 micro-siemens/cm has been is considered for demarcation of polluted zone and shown in Figure-1. The ambient and in-situ ground water quality in the

area is of less than 600 ms/cm which is reported by the ground water samples collected away from the Refinery. The ground water within the vicinity of refinery is having EC values more than 600 ms/cm. The ground water samples collected from nearby refinery are also having COD ranging from 7.20 mg/lit to 40.80 mg/lit. The COD in ground water samples should be zero. This also depicts that the ground water is contaminated in the vicinity of refinery. Higher concentration of iron is also reported from the ground water around the refinery. The Total Organic Carbon (TOC) is also present in the ground water which should be zero. The presence of TOC shows that ground water is contaminated with organic pollution. This TOC is mainly by the uncontrolled disposal of effluents from the Refinery into the cess pools and the drains. Considering all the above parameters it is estimated that ground water in about 75 Sq.km area around the refinery is contaminated.

The depth upto which the contamination has also been arrived at based on these parameters. The depth of the tubewells where contamination is identified are about 46 m bgl. It is inferred that aquifers upto the depth of about 50 m depth are contaminated. Considering the average water levels of about 7 to 8 m bgl and clay zones of 12 m thick, about 30 m thick aquifer zones filled with fresh water have been contaminated.

#### **5. Estimation of total quantum of water contaminated:**

The area contaminated = 75 Sq.km

The thickness of aquifer contaminated = 30 m thick

Specific yield of aquifer zone = 12% i.e. 0.12

Thus total quantum of water contaminated = 75 Sq.km \* 30 m \* 0.12 = 270 Million Cubic Meters of fresh water has been contaminated.

**Estimation of Environmental Compensation:** As per the Central Ground Water Authority notification vide S. O. No. 6140(E) dated 12th Dec., 2018, the water conservation fee recommended for industries drawing more than 5000 Cu.mt per day in Over-exploited areas is Rs 20/- per cubic meter. The matter was discussed with CPCB representative of the committee and based on his observations, the water conservation fee of Rs 20 is taken into consideration. Thus Taking into consideration of this fee, the dewatering of affected/contaminated water will be:

Cost of dewatering contaminated water = 270 MCM \* Rs 20

$$= 270000000 * 20 = \text{Rs } 540,00,00,000$$

i.e Rs: 540 Crores

**Environmental Management Plan proposed:** Dewatering and refilling of contaminated aquifers is proposed in this management plan. It is suggested that for dewatering of 270 MCM of water, 170 tubewells need to be constructed which are yielding about 36 Cu.mt/hour. These tubewells need to be pumped 24 hours throughout the year for a minimum period of 5 years to dewater contaminated water of 270 MCM. At the same time, surface water from the Western Yamuna Canal need to be recharged through the same number of tubewells so that the aquifers will be filled with fresh and non-contaminated water. The de-watered 270 MCM of water can be put to irrigational requirements in the surrounding areas and partly can be used for industrial requirements in Panipat Refinery. Environmental compensation amount collected from the refinery can be used for this purpose.

**Annexure-1****Ground Water Quality in and around Panipat Refinery**

The quality of shallow/deep ground water in the surrounding area distance of at least 10km. of Panipat Refinery plant has been evaluated on the basis of 31 no's of water samples collected from shallow/deep aquifers during pre-monsoon season i.e. May, 2019. All the collected samples were analyzed by adopting standard methods of analysis (APHA). Chemical analysis data of samples are given in Annexure-2. Apart from these, chemical data of water samples collected from the HSPCB is also utilised for interpretation purpose. The HSPCB data is at Annexure-3. The Total Organic Carbon data is at Annexure-4. The summarized results of ground water samples are given in Table-1 given below.

**Table: 1 Ground Water Quality of analysed samples:**

<b>S.No.</b>	<b>Parameters</b>	<b>Permissible limit</b>	<b>Ranges</b>	<b>No. of Samples</b>	<b>Percentage %</b>
1	Sp. Conductance ( $\mu\text{S}/\text{cm}$ at 25°C)	-	<600	17	54.83
			601-2250	07	45.16
2	Chloride (mg/l)	250-1000	<250	31	100
3	Fluoride (mg/l)	1.50 mg/l	<1.00	11	35.48
			1.01-1.50	11	35.48
			>1.50	09	29.03
4	Nitrate (mg/l)	45 mg/l	<45	29	93.54
			46-100	02	6.45

**pH**

In Panipat Refinery plant and surrounding area villages pH values of ground water ranges between 7.15 to 8.24.

**Specific Conductance**

Majority of samples (54.83%) are found to have specific conductance less than 600  $\mu\text{S}/\text{cm}$  at 25°C hence the ground water is fresh and potable. About 45.16% of the

samples have values which are nearby by the refinery area are having Sp. Conductance between 600- 2250  $\mu\text{S}/\text{cm}$  respectively. The specific conductance min 310  $\mu\text{S}/\text{cm}$  at 25°C at Vill-More Majra Bus stand. and max 1325  $\mu\text{S}/\text{cm}$  Vill-Kutana, Gurunanak spare parts.

### **Chloride Concentration**

The concentration of Chloride in all samples is less than 250 mg/l. Chloride concentration in most of the samples is within the maximum permissible limit of BIS for drinking water purpose.

### **Fluoride Concentration**

Fluoride is an important parameter for evaluating ground water quality. The concentration of fluoride in majority of the samples (71.00 %) is less than 1.50 mg/l and remaining 29.03% which are near by the plant area are above the permissible limit i.e. 1.5 mg/l. The min Fluoride Concentration 0.36 mg/l at Vill-Khandra, Govt. middle school, bus stand, and max 2.60mg/l at Beshwal road, Ramesh Malic, new construction.

### **Nitrate Concentration**

Nitrate is also an important parameter for evaluating ground water quality. The all samples having concentration of nitrate is less than 45 mg/l, Nitrate is an anthropogenic pollutant and plays an important role to evaluating ground water quality for various applications.

### **Total Hardness**

The total hardness concentration min **83** mg/l at Vill-Singhpura, Satpal sarpanch dera, Babadargha and max 347 mg/l at Vill-Dharamgarh, vardha ashram, bus stand.

### **Classification of Hardness**

This classification is based on the value of total Hardness. Ground water may be classified in to four type's soft, moderate hard, hard and very hard.

**Table: 2 Ground water samples summarised as per classification of Hardness**

S.No	District	Nos of Samples	Soft (0-60 mg/l)	Mod. Hard (61-120) mg/l	Hard (121-180) mg/l	Very Hard more than 180 mg/l
1	Panipat Refinery plant	31	00	04(12.90%)	09(29.03%)	18(58.06%)

As per the classification, the majority of Ground water is hard and very hard. None of the sample of in the study area are belongs to Soft category.

### **Sulphates (SO<sub>4</sub>)**

The sulphate content of ground water ranged between 1.0 mg/l to 201 mg/l at (Vill-Khandra, Govt. middle school, bus stand.)

### Heavy Metals NGT case Panipat Refinery:

Ground water samples are analyzed for six heavy metals viz Iron, Cadmium, Copper, Lead, Zinc and Manganese. The concentration of heavy metals is given in Annexure-4. The maximum and Minimum values are as follows:

### Minimum and maximum values:

Parameters	Maximum permissible limits as per BIS standards (mg/l)	Minimum (mg/l)	Maximum (mg/l)
Iron	0.3	0.013	7.205
Cadmium	0.003	0.002	0.007
Copper	1.5	BDL	0.017
Lead	0.01	BDL	0.030
Zinc	5 to 15	BDL	1.890
Manganese	0.3	BDL	0.450

### **Iron Concentration**

The 48.38% of samples having Iron concentration more than 0.30 mg/l. Iron concentrations in these samples are beyond the norms setup by BIS for drinking water purpose. The Iron concentrations min 0.013 mg/l sample no-3(M/S Gulsan Garment Noorwala, gas godown, Panipat town) and max **7.205** mg/l at (Vill-Singhpura, In the residence of Satpal sarpanch dera, Babadargha).

### **Cadmium**

Most of the samples (87%) having the concentration of cadmium within desirable limits i.e.0.003mg/l. The cadmium concentration min 0.002 mg/l sample no-27(Vtsav garden, GT road, Gagbad-vill.) and max 0.007mg/l at (Mahinder singh S/O Shri Sadhuram,CISF colony, Baholi.).

### **Copper**

In majority of samples, having copper concentration less than 0.05 mg/l. copper concentrations in these samples are within the norms setup by BIS for drinking water purpose.

### **Lead**

The most of the samples (84%) having lead concentration less than 0.010 mg/l. Only five samples having lead concentration more than 0.01 mg/l. The max 0.03mg/l concentration of Lead has been found in sample no-1 at (Vill-Nizampur,shiva temple.).

### **Zinc**

The all samples have Zinc concentration within acceptable limit i.e.5 mg/l. None of the sample has Zinc value above the permissible limit.

### **Manganese**

The most of the samples having manganese concentration within permissible limit i.e.0.30 mg/l. Only one sample has manganese value above the permissible limit i.e.0.45mg/l (Vtsav garden, GT road Gagbad-vill.).

**Bacteriological Contamination:** Ground water samples from the Panipat refinery surrounding areas were collected by HSPCB and analysed for various parameters. The data is given in Annexure-3. As per the data, the COD values ranges between 7.20 mg/l to 40.80 mg/l. As per the BIS standards, drinking water should not have BOD and COD and thus the concentrations should have been zero. The presence of COD in ground water shows that the ground water is contaminated around the refinery area. The parameter COD has also been taken into consideration for arriving at the area and aquifers contaminated by the effluents of Panipat Refinery.

**Total Organic carbon:** Total Organic Carbon values range between 1.18 mg/l to 82.60 mg/l. All the samples collected around the refinery are having the TOC. TOC for the ground water to be used for drinking purposes should be zero. Presence of TOC shows the organic contamination of ground water.

<b>Annexure-2</b>																	
<b>S. No</b>	<b>Location</b>	<b>Sour ce</b>	<b>Depth in mts</b>	<b>pH*</b>	<b>EC* in <math>\mu</math>S/cm at 25<sup>o</sup> C</b>	<b>HCO<sub>3</sub></b>	<b>Cl*</b>	<b>SO<sub>4</sub></b>	<b>NO<sub>3</sub></b>	<b>F*</b>	<b>PO<sub>4</sub></b>	<b>Ca*</b>	<b>Mg*</b>	<b>Na</b>	<b>K</b>	<b>SiO<sub>2</sub></b>	<b>TH *as CaCO<sub>3</sub></b>
						mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
<b>1</b>	Vill- Nizampur, shiva temple.	S.B.	46	7.63	450	268	36	6	0	0.61	0	8	50	23	2.9	12	225
<b>2</b>	Radha swami sat sang beas, sec-18.	S.B.	38	8.08	425	281	21	2	0	1.21	0	8	27	60	1.9	9	133
<b>3</b>	M/S Gulsan Garment Noorwala, gas godwon	T.W.	46	7.97	435	293	28	5	0	2	0	21	22	67	2.3	8	143
<b>4</b>	Beshwal road, Ramesh Malic, new construction	T.W.	76	7.74	330	232	29	8	1	2.6	0	16	17	58	1.3	10	112
<b>5</b>	Krishana filling station, Sanoli road.	S.B.	76	7.94	670	330	43	90	7	1.6	0	4	55	90	3.1	15	235
<b>6</b>	M/S R.K. industry, Bapoli road, Nimbori.	T.W.	24	8.02	770	293	43	149	0	1.3	0	4	47	116	2.6	12	204
<b>7</b>	Ishwer Singh, nearby Samadh, vill-chajpur.	T.W.	76	7.8	690	317	28	115	0	0.37	0	8	55	80	2.7	7	245
<b>8</b>	Vill-Dahar, New balaji veshno dhaba, Gohana road.	T.W.	91	7.91	550	317	43	6	20	1.4	0	8	40	73	3.1	5	184
<b>9</b>	Vill-Dadlana, near water tank.	H.P.	36	7.96	450	232	50	3	3	0.49	0	8	35	45	4.6	8	163
<b>10</b>	Vill-	T.W.	106	7.72	325	232	28	1	5	2.4	0	16	17	58	2.2	11	112

	Dadlana,PHE, T.W.																
11	Mahinder singh S/O Shri Sadhuram,CISF colony,Baholi.	H.P.	33	7.84	890	598	43	4	9	1.4	0	4	35	187	4	13	153
12	Mahinder singh S/O Shri Sadhuram ,CISF,colony,Ba holi.	S.B.	35	7.89	990	683	57	15	17	1.2	0	8	30	241	5	16	143
13	Naphtha creeker, glycol road nursery.	H.P.	30	7.62	590	220	113	7	2	1.1	0	12	55	40	8.1	16	255
14	Ravi kumar ranga,KBPL gate,Phool singh dera.	S.B.	40	7.65	840	403	113	94	11	1.7	0	4	62	148	11	15	265
15	Pawan s/o Pale ram, near railway line,Baholi.	H.P.	27	7.74	895	647	92	11	9.2	1.53	0	4	55	249	5.2	12	235
16	Munsiram,sohan lal dera,Inside Raily line,Baholi.	H.P.	30	7.92	590	281	43	2	6	2.3	0	4	22	90	3.3	13	102
17	Vill- Singhpura,Satpa l sarpanch dera,Babadargh a	H.P.	46	8.01	950	464	43	20	20	2.2	0	17	10	183	3	14	83
18	Vill- Singhpura,NC plant 6km,Rotashpal sweet.	H.P.	23	7.65	310	159	21	2	2	1.3	0	25	20	10.3	2.3	12	143
19	Vill- Baljatan,sachin	H.P.	21	7.74	1240	586	43	18	15	2.9	0	8	35	189	4	10	163

	beauty salon.																
20	Vill-Dharamgarh, vardha ashram, bus stand.	H.P.	46	7.47	1190	366	99	89	33	1.16	0	8	80	78	5.1	9	347
21	Vill-Khandra, Govt. middle school, bus stand.	H.P.	46	7.57	1090	195	156	201	29	0.36	0	20	50	161	6	7	255
22	Vill-Munak, Bus stand.	H.P.	36	7.5	885	488	21	9.6	12	0.86	0	8	27	145	4	2	133
23	Vill-Rer Kalan, Shiva temple.	H.P.	34	7.75	1030	488	57	47	1	0.65	0	12	37	157	5.2	9	184
24	Vill-Kutana, Gurunank spare parts.	H.P.	27	7.54	1325	549	121	48	25	0.86	0	4	62	193	6	5	265
25	Vill-Begampur, Shiva temple.	H.P.	34	7.52	1050	515	99	10	50	1.51	0	4	55	172	5.5	11	235
26	Vill-Gudoh, Kashyap chopal.	S.B.	46	7.15	920	281	142	46	58	0.35	0	8	72	95	5.4	12	317
27	Vtsav garden, GT road, Gagbad-vill.	S.B.	34	7.41	510	244	85	37	19	0.71	0	4	60	52	6	8	255
28	Filling junction, Babarpur, G.T road.	S.B.	50	7.32	690	171	149	31	19	0.77	0	16	55	58	6	7	265
29	Vill-Ballaa, Gaoushalla.	S.B.	56	8.17	590	305	14	29	12	0.4	0	45	30	32	5.2	13	235
30	Vill-More Majra Bus stand.	SB	30	8.24	310	134	14	6.5	15	1.32	0	33	12	7.6	2.7	10	133
31	Vill-More Majra, Water works.	TW	91	7.89	575	207	43	54	18	1.2	0	45	30	30	4	12	235

## Annexure-3

Sample Results of Thirana Drain, Accumulated Surface Water In and around IOCL Green belt Area

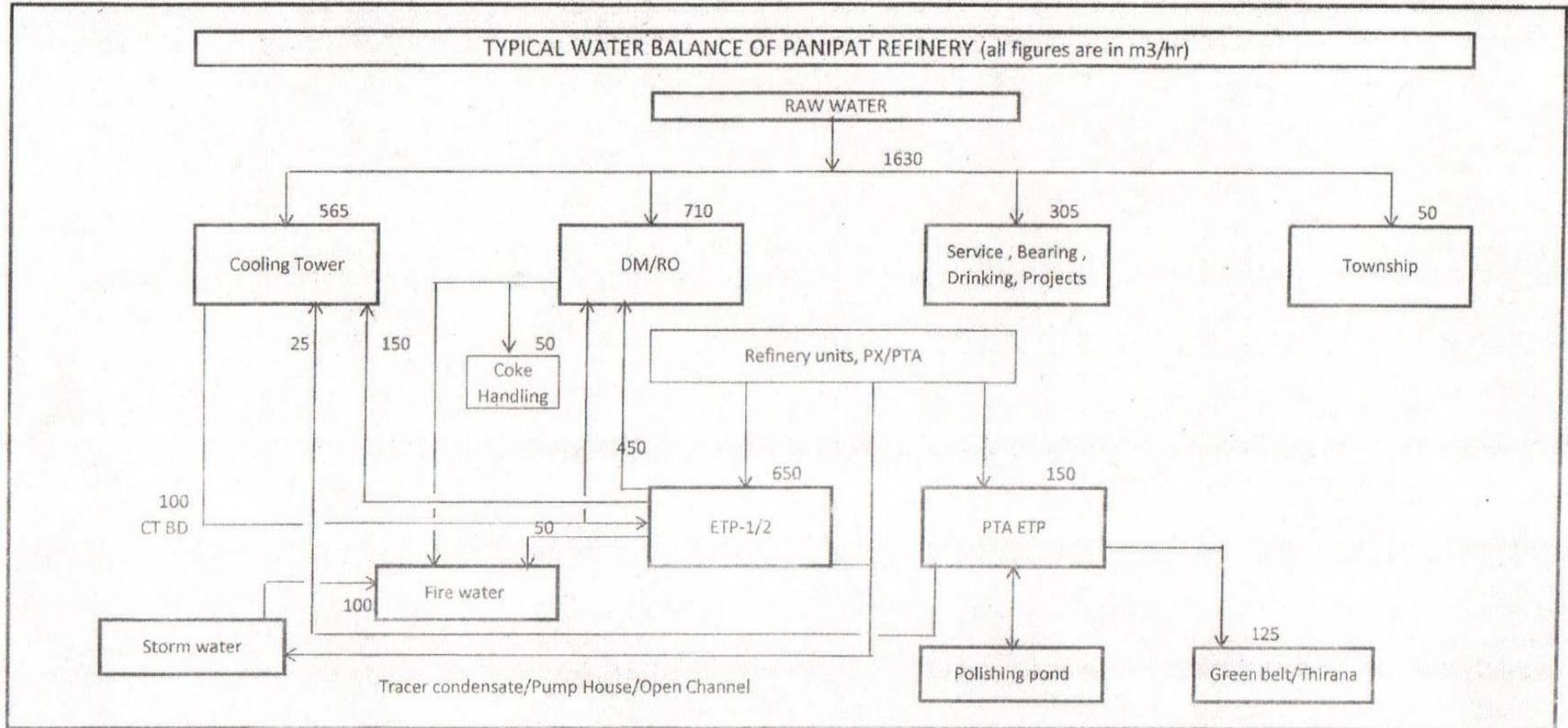
	Limit (*) mg/l	Limit (*) mg/l	Thirana drain near bridge Neptha gate 04.12.18	Stagnent water in plantation area 04.12.18	IOCL boundary green belt area opp. To FLM 109 04.12.18	Outlet pipe of ETP-III near culvert 04.12.18	Effluent discharge from green belt leading to Thirana (u/s) 04.12.18	Effluent discharge from green belt leading to Thirana (d/s) 04.12.18	Effluent standing in Green Belt leading to Thirana belt 04.12.18	Final outlet of ETP II 05.12.18	Final Outlet of ETP-I 05.12.18	ETP-III outlet at Thirana drain 05.12.18	Cess pool opp. FLM- 108 05.12.18	Outlet of ETP-IV 06.12.18
	ETP-I, II & IV	ETP-III												
pH	6.5-8.5	6.5-8.5	6.72	6.57	7.35	7.50	7.15	6.14	7.27	6.58	6.81	7.52	6.89	7.25
TSS	20	100	<b>124.0</b>	<b>552.0</b>	<b>252.0</b>	<b>202.0</b>	16.0	56.0	92.0	24.0	11.0	<b>142.0</b>	194.0	64.0
BOD	15	30	<b>102.0</b>	<b>1200.0</b>	<b>880.0</b>	<b>200.0</b>	50.0	60.0	52.0	48.0	21.0	<b>170.0</b>	900.0	10.0
COD	125	250	<b>360.0</b>	<b>3580.0</b>	<b>2872.0</b>	<b>662.4</b>	201.2	246.4	226.4	179.2	120.0	<b>460.8</b>	<b>5472.0</b>	64.4
Oil&Grease	5.00	10	6.0	16.0	13.0	5.0	4.0	4.0	ND	7.0	3.5	8.5	17.5	ND
Ammonical Nitrogen	15	50	10.64	8.96	4.48	7.28	4.48	6.16	5.04	8.4	ND	3.36	4.48	0.58
TDS	2000	2000	<b>1350.0</b>	<b>2520.0</b>	<b>2824.0</b>	<b>2010.0</b>	1580.0	1570.0	1730.0	900.0	1090.0	<b>2224.0</b>	<b>3050.0</b>	
Cond.			<b>2240.0</b>	<b>4190.0</b>	<b>4690.0</b>	<b>3340.0</b>	2620.0	2600.0	2870.0	1491.0	1807.0	<b>3680.0</b>	<b>5070.0</b>	<b>2042.0</b>
Fluoride	2.0	5.0	1.0	3.0	3.0	3.0	1.8	1.8	0.8	0.2	0.3	0.5	1.0	0.2
C6H5OH	0.35	<1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	1	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	5.0	2.0	0.041	0.075	0.065	0.044	0.070	0.057	0.062	0.077	0.080	0.051	0.086	0.035
Nickel	1	0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	3.0	3.0	<b>5.661</b>	<b>8.370</b>	<b>2.598</b>	<b>1.816</b>	1.794	1.866	0.852	0.437	0.484	0.406	2.806	0.064
Chrome	2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexa.Chrome	0.1	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.1	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.0	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphide	0.5	2	4.0	8.0	6.0	ND	ND	ND	1.2	0.4	ND	0.8	1.6	ND
Phosphate	3.0	5.0												ND

Standards has been taken as per EP Act,1986 for discharge of Environmental Pollutants from Panipat Refinery & Petro-chemical Complex and General standard for inland surface water parameter.Exceeding value of parameter has been shown in bold.

Results of Handpump/ Borewell Water Collected from Villages Bohli, Singhpura (Sithana) and Dadlana

Parameter Unit : mg/L	Permissible Limit/ permissible limit in the absence of alternate source mg/l (*)	Hand pump Nersury neptha cracker glycol road 04/12	Hand pump near Sohan Lal dera Bohli 04/12	Hand pump House of Mulekhraj Baholi 04/12	Hand pump House of Munsil ram Baholi 06/17	Hand pump of Sh. Babu ram 06.12.18	Hand pump of Sh. Pawan 06.17.18	Hand pump of Sh. Ravi kumar near KBPL gate 06.12.18	Bohli CWSF Hand pump 06.17.18	Submersible pump 06.12.18	Hand pump of sarpanch Kabri 06.12.18	Hand pump Singhpura 06.12.18	Handpump Dadlana 06.12.18
	↓ MR No →	5534	5534	5534	5534	5541	5542	5543	5544	5545	5546	5547	5548
pH	6.5-8.5	6.99	7.04	7.33	7.18	7.10	7.28	7.27	7.38	7.13	7.43	8.27	7.26
TSS	100	4.0	2.0	112.0	2.0	ND	ND	27.0	ND	ND	6.0	29.0	ND
BOD	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COD	250	40.8	24.4	76.8	17.6	12.8	8.8	7.2	20.0	18.0	14.0	12.8	14.0
O&G	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen	50/no relaxation	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TDS	500/2000	610.0	638.0	480.0	442.0	740.0	980.0	910.0	1420.0	1000.0	800.0	520.0	370.0
Conductivity		1005.0	1054.0	784.0	722.0	1233.0	1548.0	1461.0	2270.0	1667.0	1271.0	864.0	615.0
Chlorides	250/1000	124.0	50.0	52.0	22.0	26.0	104.0	132.0	126.0	62.0	30.0	50.0	17.0
Hardness	200/600	470.0	302.0	170.0	80.0	318.0	520.0	364.0	184.0	272.0	180.0	40.0	262.0
Calcium	75/200	88.0	56.8	40.8	40.0	84.0	72.0	46.4	21.6	44.8	20.8	8.0	47.2
Magnesium	30/100	60.75	38.88	16.5	19.4	26.2	82.62	60.2	31.59	38.88	31.1	4.86	34.9
Fluoride	1.0/1.5	0.8	1.3	2.1	1.4	0.3	1.0	1.0	1.0	1.0	8.0	8.0	0.2
Phenolic compound	0.001/0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphate	200/400					140.7	131.6	213.9	310.2	270	100.4	51.0	32.0
Copper	0.05/1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	05 or 15	0.531	0.454	0.887	0.104	0.047	1.096	0.204	0.294	0.066	0.072	0.559	0.029
Nickel		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	0.3/ no relaxation	1.329	1.468	25.167	1.020	0.491	0.268	0.180	0.320	0.009	0.766	1.732	0.071
Chrome	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexa. Chrome	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphide	0.05/no relaxation	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Indian Standard Drinking water parameter, IS:10500:2012 and Exceeding value of parameter has been shown in bold.



## Annexure-4

Pollution studies around Panipat Refinery, Panipat-Heavy metals analysis (concentrations in mg/l)

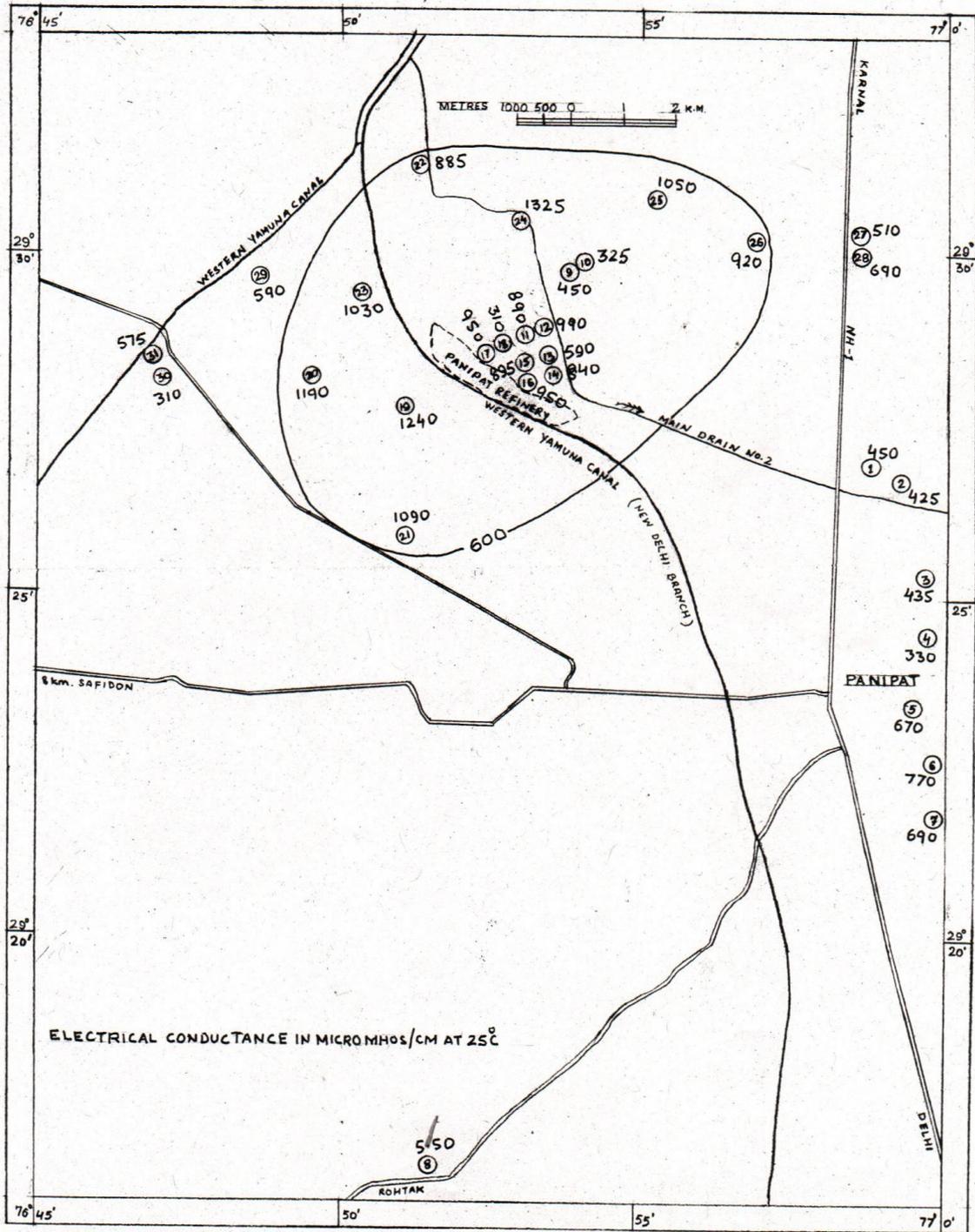
S. No	Location	Source	Cd	Cu	Mn	Pb	Zn	Fe
1	Vill-Nizampur, shiva temple.	T.W.	0.003	0.003	BDL	0.030	0.032	0.540
2	Radha swami sat sang beas, sec-18.	T.W	0.005	BDL	BDL	0.022	0.017	0.240
3	M/S Gulsan Garment Noorwala, gas godwon	T.W.	BDL	BDL	BDL	0.020	0.098	0.013
4	Beshwal road, Ramesh Malic, new construction	T.W.	BDL	BDL	BDL	0.014	0.012	BDL
5	Krishana filling station, Sanoli road.	S.B.	BDL	BDL	BDL	0.016	0.061	BDL
6	M/S R.K. industry, Bapoli road, Nimbori.	T.W.	BDL	BDL	BDL	0.013	0.008	BDL
7	Ishwer Singh, nearby Samadh, vill-chajpur.	T.W.	0.005	BDL	BDL	BDL	0.010	BDL
8	Vill-Dahar, New balaji veshno dhaba, Gohana road.	T.W.	BDL	BDL	BDL	BDL	0.018	0.113
9	Vill-Dadlana, near water tank.	H.P.	BDL	BDL	BDL	BDL	0.264	0.524
10	Vill-Dadlana, PHE, T.W.	T.W.	0.006	BDL	BDL	BDL	BDL	0.264
11	Mahinder singh S/O Shri Sadhuram, CISF colony,	H.P.	0.007	BDL	BDL	0.007	0.159	1.877
	Baholi.							
12	Mahinder singh S/O Shri Sadhuram, CISF, colony, Baholi.	T.W.	BDL	BDL	BDL	0.009	BDL	0.043
13	Naphtha creeker, glycol road nursery.	H.P.	BDL	BDL	BDL	0.004	0.110	BDL
14	Ravi kumar ranga, KBPL gate, Phool singh dera.	T.W	BDL	BDL	BDL	0.006	BDL	BDL
15	Pawan s/o Pale ram, near railway line, Baholi.	H.P.	BDL	BDL	BDL	0.001	BDL	4.985
16	Munsiram, sohanlal dera, Inside Raily line, Baholi.	H.P.	BDL	BDL	BDL	BDL	BDL	0.031
17	Vill-Singhpura, Satpal sarpanch dera, Babadargha	H.P.	BDL	0.011	BDL	BDL	0.021	7.205
18	Vill-Singhpura, NC plant 6km, Rotashpal sweet.	H.P.	BDL	0.007	BDL	BDL	BDL	1.848
19	Vill-Baljatan, sachin beauty salon.	H.P.	BDL	0.008	BDL	BDL	0.092	1.187

20	Vill-Dharamgarh, vardha ashram, bus stand.	H.P.	BDL	0.014	BDL	0.010	0.577	1.239
21	Vill-Khandra, Govt. middle school, bus stand.	H.P.	BDL	0.007	0.164	0.005	0.053	1.180
22	Vill-Munak, Bus stand.	H.P.	BDL	0.005	BDL	BDL	BDL	0.178
23	Vill-Rer Kalan, Shiva temple.	H.P.	BDL	0.003	BDL	0.009	BDL	1.311
24	Vill-Kutana, Gurunanak spare parts.	H.P.	BDL	0.002	BDL	0.006	BDL	1.642
25	Vill- Begampur, Shiva temple.	H.P.	BDL	0.003	BDL	0.016	1.890	2.284
26	Vill-Gudoh, Kashyap chopal.	T.W.	BDL	0.002	0.165	BDL	BDL	2.925
27	Vtsav garden, GT road, Gagbad-vill.	T.W	0.002	0.001	0.451	BDL	3.175	BDL
28	Filling junction, Babarpur, G.T road.	T.W.	0.003	BDL	BDL	BDL	BDL	0.394
29	Vill- Ballaa, Gaoushalla.	T.W	BDL	0.004	BDL	BDL	BDL	0.164
30	Vill-More Majra Bus stand.	T.W	BDL	0.017	BDL	BDL	BDL	0.104
31	Vill-More Majra , Water works.	TW	BDL	0.002	BDL	BDL	BDL	0.232

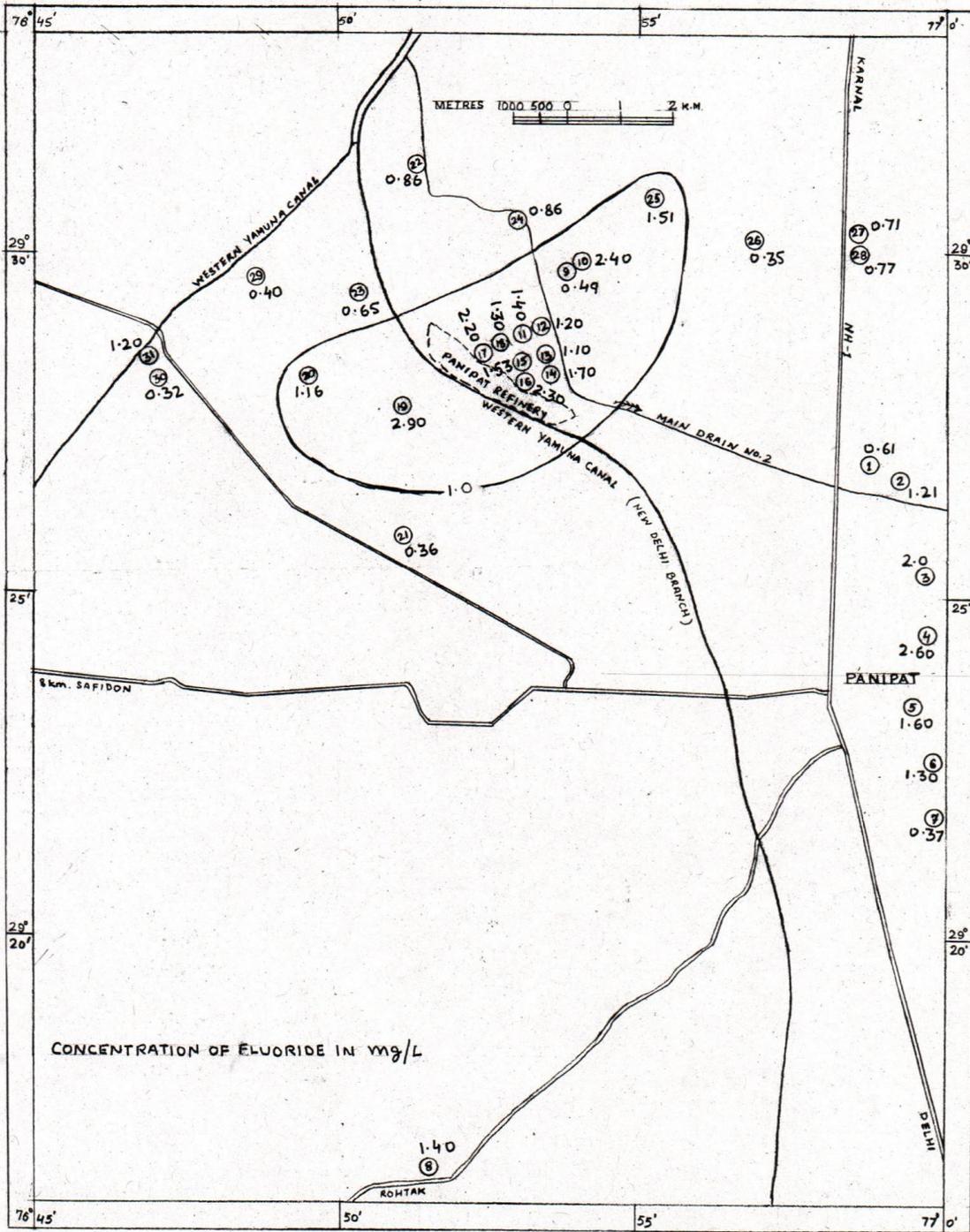
**TOC data of ground water samples  
around Panipat Refinery**

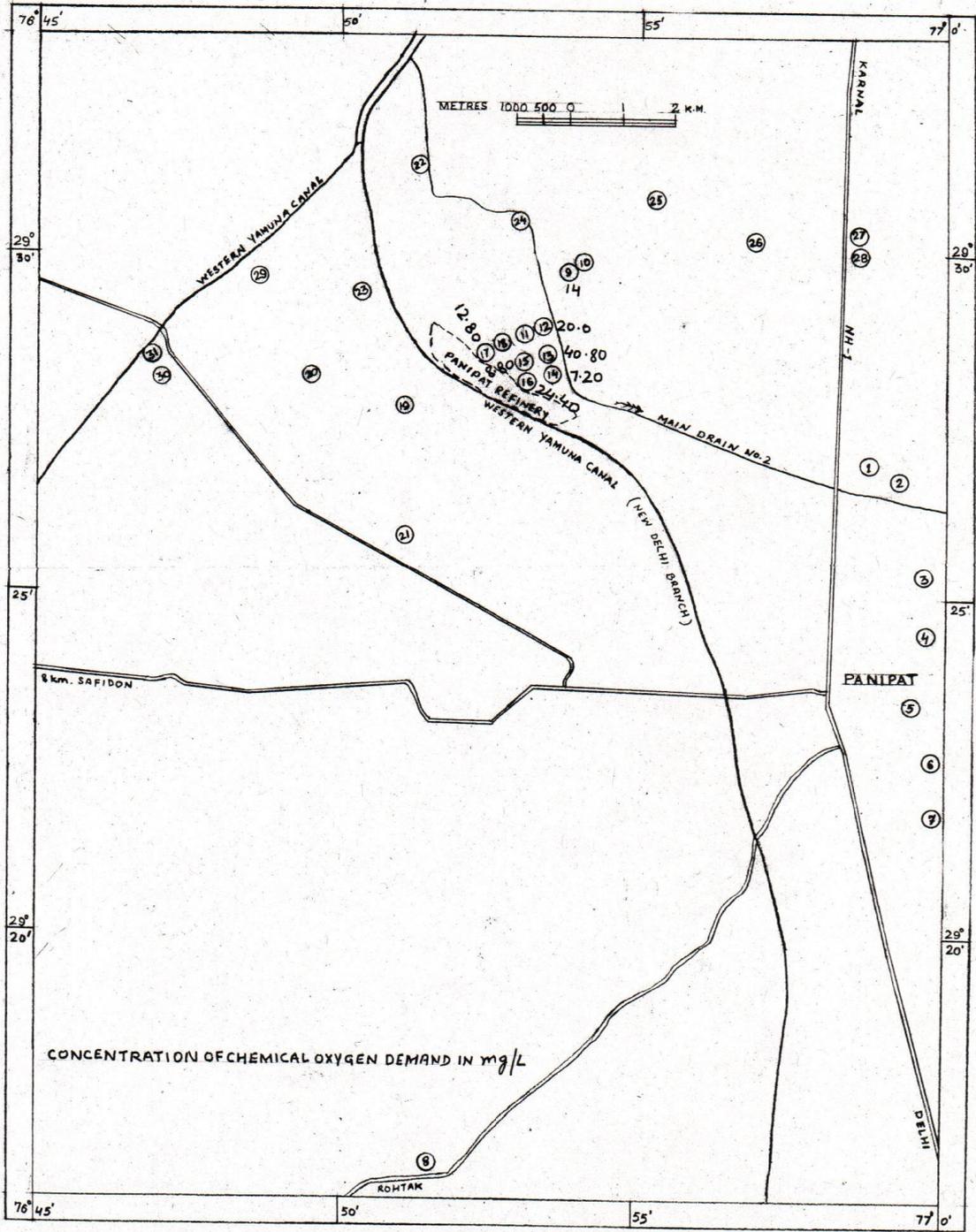
Annexure-5

S. No	Unique ID	District	Location	Source	TOC (NPOC) mg/l
1	1TOC	Panipat	Vill-Dadlana, near water tank.	H.P.	15.35
2	2TOC	Panipat	Vill-Dadlana,PHE, T.W.	T.W.	2.270
3	3TOC	Panipat	Mahinder singh S/O Shri Sadhuram,CISF colony,Baholi.	H.P.	52.26
4	4TOC	Panipat	Mahinder singh S/O Shri Sadhuram ,CISF,colony,Baholi.	Tubewell	82.60
5	5TOC	Panipat	Naphtha creeker, glycol road nursery.	H.P.	21.25
6	6TOC	Panipat	Ravi kumar ranga,KBPL gate,Phool singh dera.	Tubewell	37.64
7	7TOC	Panipat	Pawan s/o Pale ram, near railway line,Baholi.	H.P.	0.72
8	8TOC	Panipat	Munsiram,sohanlal dera,Inside Raily line,Baholi.	H.P.	2.19
9	9TOC	Panipat	Vill-Singhpura,Satpal sarpanch dera,Babadargha	H.P.	47.11
10	10TOC	Panipat	Vill-Singhpura,NC plant 6km,Rotashpal sweet.	H.P.	46.45
11	11TOC	Panipat	Vill-Baljatan,sachin beauty salon.	H.P.	31.04
12	12TOC	Panipat	Vill-Dharamgarh,vardha ashram,bus stand.	H.P.	44.19
13	13TOC	Panipat	Vill-Khandra, Govt. middle school, bus stand.	H.P.	45.51
14	14TOC	Panipat	Vill-Munak,Bus stand.	H.P.	1.18
15	15TOC	Panipat	Vill-Rer Kalan,Shiva temple.	H.P.	1.33

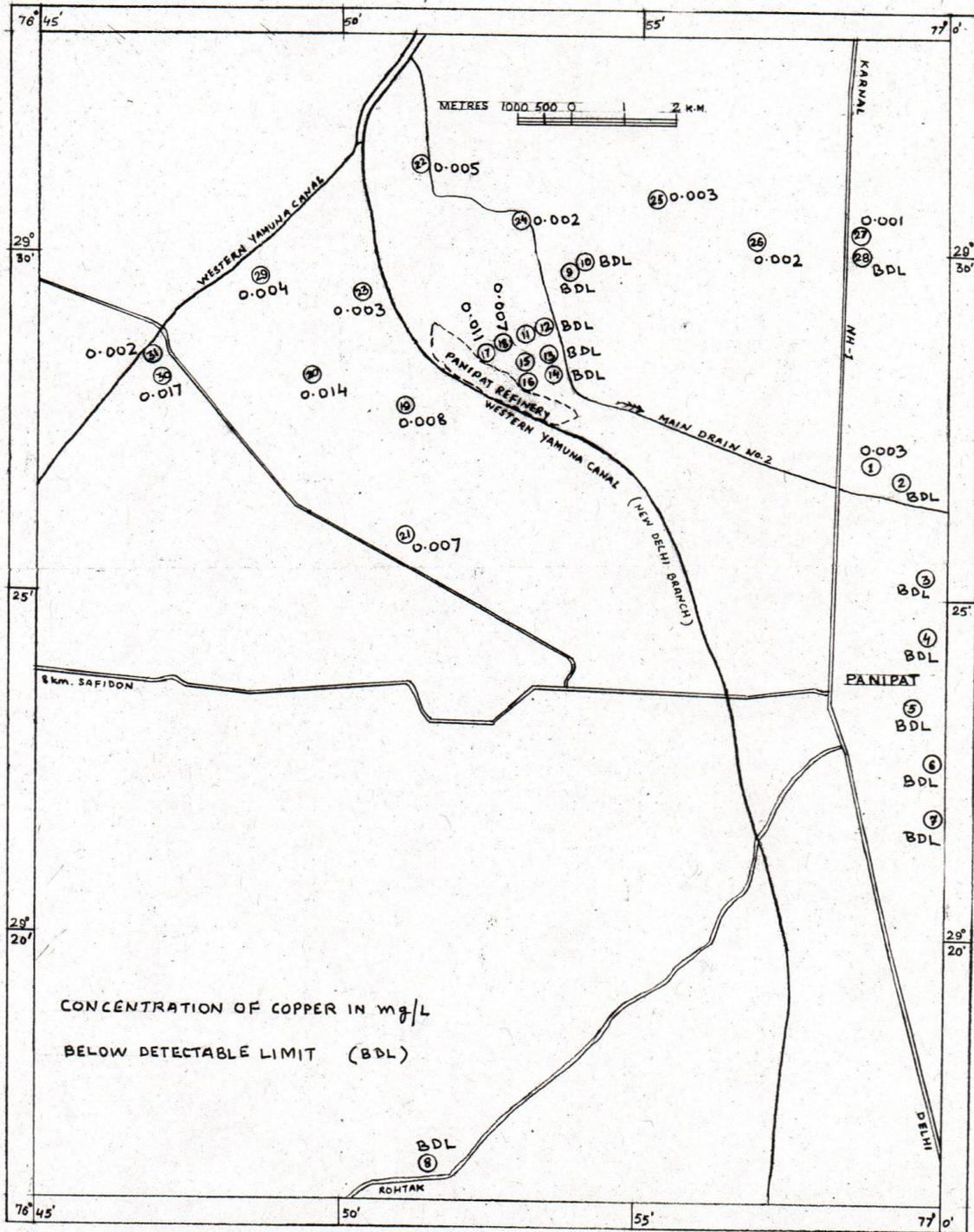


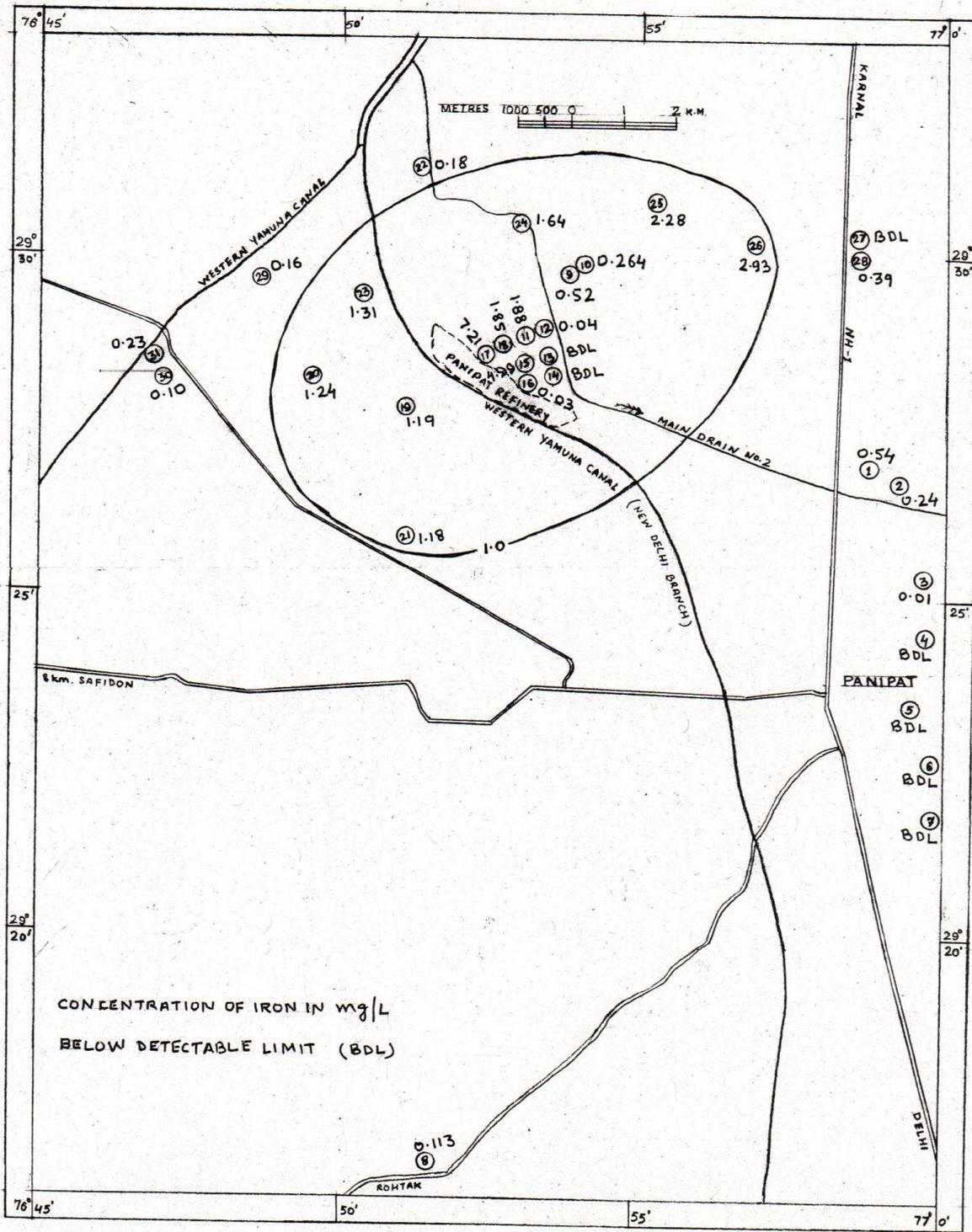


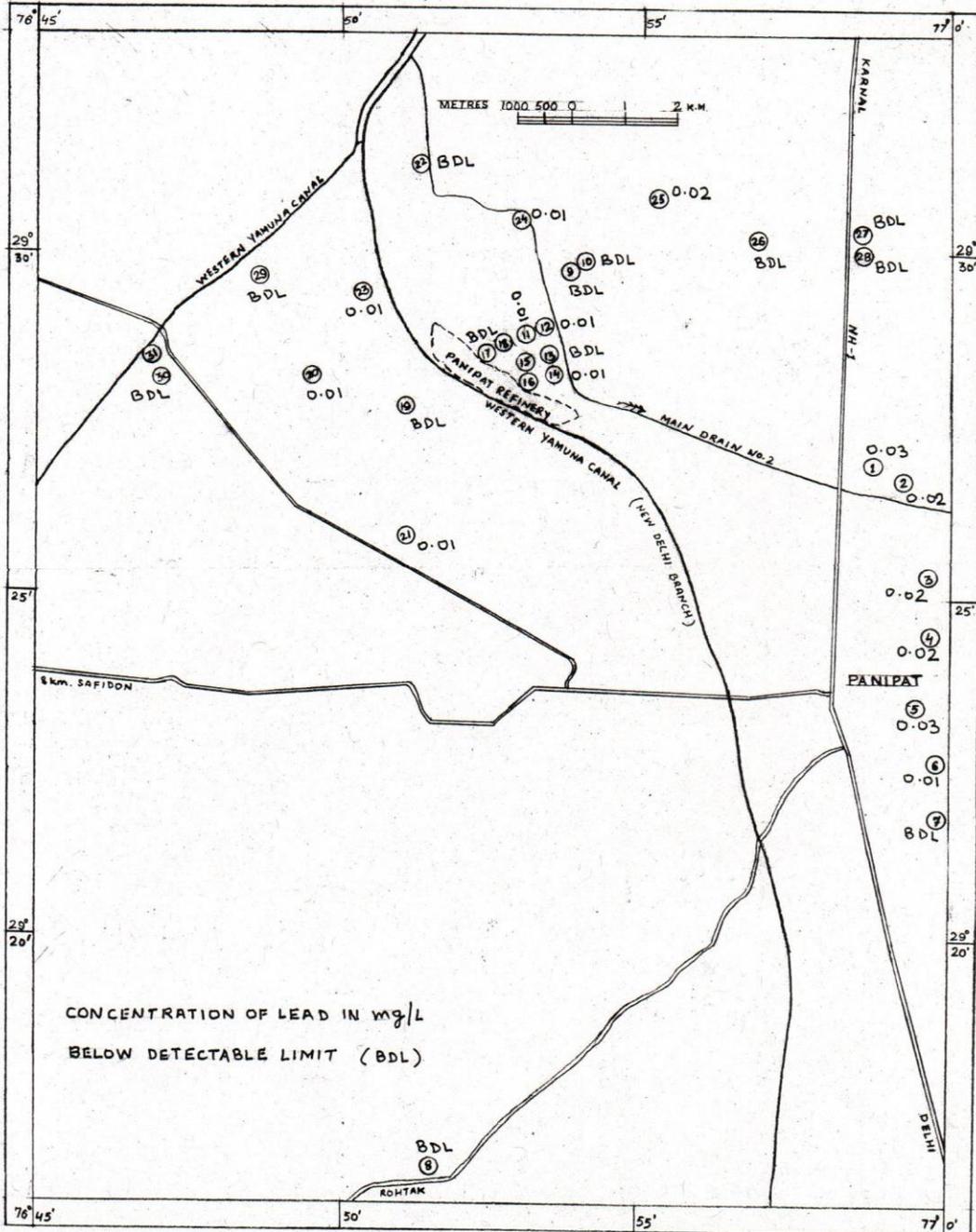


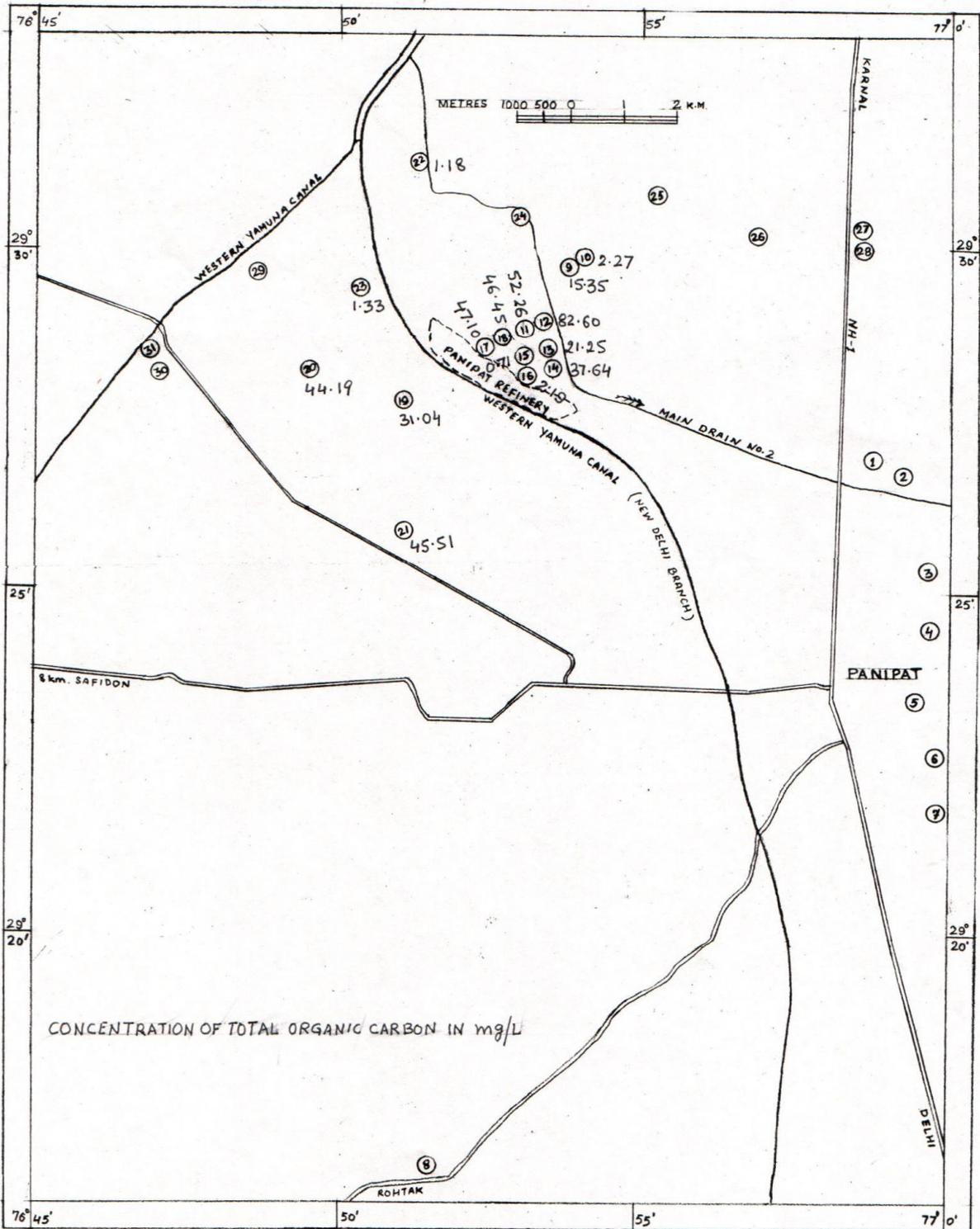












**Report on Environmental Compensation for Ground Water Contamination by Panipat Refinery as per Hon'ble NGT Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery in Compliance of Hon'ble NGT Order dated 01.03.2019**

During the hearing of the case OA No. 738/2018 titled Satpal Singh and Others Vs Indian Oil Corporation Limited, Panipat Refinery before Hon'ble NGT on 01.03.2019, the following directions were issued by the Hon'ble Tribunal:

*"In the light of findings recorded in the spot inspection report, we consider it necessary to require the **joint Committee constituted by this Tribunal vide order dated 15.11.2018** to make a realistic assessment of the damage caused to public health and environment and immediate measures for stoppage of polluting activity. Such report may be furnished within one month by email at [ngt.filing@gmail.com](mailto:ngt.filing@gmail.com). The Committee is at liberty to take any expert opinion or co-opt any other expert. The compensation proposed must be adequate to meet the cost of restoration of environment and public health and deterrent against the polluter so that such action is not repeated".*

Accordingly, the committee constituted by Hon'ble NGT, co-opted a member from Central Ground Water Board for taking up ground water pollution studies around the Panipat Refiner to assess the areal impact of pollution caused by Panipat Refinery both laterally and vertically (Depth wise). Sh. S.K. Mohiddin, Sr. Hydrogeologist, Central Ground Water Board (CGWB), North West Region, Chandigarh was nominated by CGWB for this study.

CGWB has taken up the detailed study around the Refinery and collected 31 ground water samples covering an area of about 500 Sq.km around the Refinery to assess the ground water contamination. Groundwater sampling and analysis was done by Sh. Dhan Prakash, Sc 'B' CGWB during May and June, 2019 (Annexure-I & II). Apart from these 31 samples, the data collected by the HSPCB during the preliminary study was also used for the study. Effluent water quality before treatment and after

treatment as well as the cess pool samples and stagnant water samples from the ponds of Refinery were collected and analysed by HSPCB and given in Annexure-3.

**2. Hydrogeological condition around the Panipat Refinery:** The Refinery is located adjacent to Western Yamuna Canal (Delhi Branch). The area is flat alluvial plain underlain by arid brown soil. The geological formation comprises of unconsolidated alluvial deposits. The principal aquifer system comprises of fine to coarse sand and sand associated with kankar. A number of aquifers are present in the area as per the exploratory data of CGWB. The exploratory drilling data of CGWB reveals that fine to coarse sand aquifers are intercalated with clay layers giving rise to multiple aquifer system with confining conditions. The aquifer which is fine to coarse sand are intercalated with thin clay layers. It is observed that first sand layer is present from 10.00 m to 35.00 mts below ground level (bgl), with clay intercalation at 18.00 m to 21.00 m bgl and 27.00 m to 31.00 m. A consistent clay layer of about 9 m thickness is present from 35.00 m to 44.00 m bgl. This is followed by aquifer present between 44.00 to 82.5 m bgl underlain by thick clay layer which extends upto 95.00 m bgl. The second aquifer is present between 95 to 130 m bgl. It is observed that most of the shallow tubewells are in the depth range of 30 m to 46 m with discharges varying between 8 to 14 Litres per Second (LPS). Depth to water level around the vicinity of Refinery and Western Yauna Canal is shallow i.e. 5.00 to 6.00 m bgl. Away from the Western Yamuna canal, depth to water level is about 18.00 m to 20.00 m bgl. Depth to piezometric head i.e. water level of deeper aquifer is also 18.32 m bgl in Baholi piezometer and 16.81 m bgl in Khandra.

**3. Ground Water Quality:**

Ground water samples from 31 shallow handpumps and deep tubewells were collected for analysis. Data collected by HSPCB, Haryana, are also taken into consideration for demarcation of area of contamination. The data and interpretation along with the maps are at Annexure-1.

**4. Demarcation of Contaminated area:** A number of parameters are considered for demarcation of contaminated zone. Important parameters considered are Electrical Conductivity, Chemical Oxygen demand (COD), Total Organic Carbon (TOC) and Fluoride concentrations and heavy metals Iron and Zinc. Presence of all

the above parameters are examined against the BIS Standards prescribed for drinking water quality.

The threshold value for Electrical Conductivity is taken as less than 1000 ms/cm from shallow ground water which is also acceptable limit for drinking water quality. Thus the ambient and in-situ ground water quality in the area is of less than 1000 ms/cm which is reported by the ground water samples collected away from the Refinery. The acceptable limits of Electrical Conductivity for drinking water is 1000 ms/cm (Total Dissolved Solids – 500 mg/lit) and 3000 ms/cm is permissible if any alternative source of drinking water is not available (TDS is 2000 mg/lit). In shallow ground water, the Electrical Conductivity values ranges between 840 ms.cm to 1240 ms/cm within the vicinity of refinery and well within the permissible limits of drinking water quality if alternate sources are not available. But the increased value of Electrical Conductivity within the vicinity of refinery shows contamination and mixing of effluents with shallow ground water as also indicated by other constituents. The water samples of cess pool water, stagnate water, ETP outlet waters and other surface water samples where effluents are being released are having Electrical Conductivity values varying between 1491 to 5070 ms/cm (Annexure-3). Thus seepage of this water and mixing with ground water is causing the ground water around the refinery contaminated and increase in the Electrical Conductivity. The E.C. value of contaminated ground water is also less than 2000 ms/cm which is the permissible limits for drinking water.

Chemical Oxygen Demand (COD) is another parameter which is considered for demarcation of polluted zone. The water samples of cess pool water, stagnate water, ETP outlet waters and other surface water samples where effluents are being released are having COD values varying between 120 mg/lit to 5472 mg/lit. Thus the very high value of COD in effluents released on surface is causing the contamination of ground water resulting in increase in COD in ground water. COD in shallow ground water varies from 7.2 to 76.8 mg/lit. The data analysed by HSPCB was used for interpretation of COD.

Iron is another parameter which is obtained in higher concentrations in effluent water stored in cess pool etc. Iron concentration in stored effluents water varies from 0.4 mg/lit to 5.6 mg/lit. Iron concentration in shallow ground water is

more than 1.0 mg/lit around the refinery complex. The permissible limit of iron in drinking water is 0.3 mg/lit. Presence of iron at higher concentrations shows the contamination of shallow ground water because of effluent water released on the surface.

Another parameter considering for study of ground water contamination by the effluents is Total Organic Carbon due to contamination by petroleum products/effluents. Total Organic Carbon values range between 1.18 mg/lit to 82.60 mg/lit in the samples analysed. All the samples collected around the refinery are having the TOC. This TOC is mainly by the uncontrolled disposal of effluents from the Refinery into the cess pools and the drains. No limit has been prescribed by BIS for TOC in drinking water. Presence of TOC shows the organic contamination of ground water.

Heavy metals like Copper, Zinc, Nickel, Chrome, Lead and Cadmium have been analysed from the effluent water stagnating around the refinery. Out of these parameters, only zinc is found beyond permissible limit in the effluent samples. All other parameters are below detectable limits. In ground water heavy metals parameters like cadmium, copper, manganese, lead and zinc are analysed. All these elements are below permissible limits prescribed for drinking water.

Based on the distribution of various parameters the contaminated zone has been demarcated. Considering all the above parameters it is estimated that ground water in about 72 Sq.km area around the refinery is contaminated by one or more than one parameters as discussed above.

The depth upto which the contamination has also been arrived at based on hydrogeology and presence of these parameters. The maximum depth of the tubewells where contamination is identified are about 45 m bgl. Depth of most of the tubewells are 21 m bgl to 36 m bgl which are tapping the first aquifer of 35.00 m depth. There is a thick clay layer of 9 m thick between the two aquifers. This thick clay layer of 9 m thick is acting as good attenuation layer and restricting the pollution plume movement to the deeper aquifers. Considering the general depth of the most of the tubewells and hydrogeological conditions and aquifer disposition, it can be inferred that aquifers upto a depth of 35 m bgl are contaminated. Considering the

average water levels of about 7 to 8 m bgl and clay zones of 7 m thick, about 20 m thick aquifer zones have been contaminated.

#### **5. Estimation of total quantum of water contaminated:**

The area contaminated = 72 Sq.km

The thickness of aquifer contaminated = 20 m thick

Specific yield of aquifer zone = 12% i.e. 0.12

Thus total quantum of water contaminated =  $72 \text{ Sq.km} * 20 \text{ m} * 0.12 = 172.8$  Million Cubic Meters of fresh water has been contaminated which is not fit for drinking water purposes.

#### **6. Drinking water supply in the villages around the refinery**

It is estimated that about 173 MCM of total quantum of shallow ground water is contaminated with one or more than one parameter in the shallow aquifer down to a depth of 35 m bgl. The water supply in all the villages surrounding the Panipat refinery are based on ground water from deeper aquifers which is being supplied by PHED Department of Government of Haryana. As the ground water of deeper aquifers are meeting the standards prescribed by BIS (ISO10,500 of 2012) which is being supplied for drinking and domestic water requirements by piped water system.

**Annexure-1****Ground Water Quality in and around Panipat Refinery**

The quality of shallow/deep ground water in the surrounding area upto a distance of about 10km. of Panipat Refinery plant has been studied and 31 no's of water samples were collected from shallow/deep aquifers during pre-monsoon season i.e. May, 2019. All the collected samples were analyzed by adopting standard methods of analysis (APHA) in the Regional Chemical Lab of CGWB. Chemical analysis data of samples are given in Annexure-2. Apart from these, analysis data of water samples collected from the HSPCB is also utilised for interpretation purpose (Annexure-3). The Total Organic Carbon content in the ground water samples is presented at Annexure-4. The summarized results of ground water samples are given in Table-1 given below.

**Table: 1 Ground Water Quality of analysed samples:**

<b>S.No.</b>	<b>Parameters</b>	<b>Permissible limit</b>	<b>Ranges</b>	<b>No. of Samples</b>	<b>Percentage %</b>
1	Sp. Conductance ( $\mu\text{s}/\text{cm}$ at 25°C)	-	<600	17	54.83
			601-2250	07	45.16
2	Chloride (mg/l)	250-1000	<250	31	100
3	Fluoride (mg/l)	1.50 mg/l	<1.00	11	35.48
			1.01-1.50	11	35.48
			>1.50	09	29.03
4	Nitrate (mg/l)	45 mg/l	<45	29	93.54
			46-100	02	6.45

**pH**

In Panipat Refinery plant and surrounding area villages pH values of ground water ranges between 7.15 to 8.24.

### **Specific Conductance**

Majority of samples (54.83%) are found to have specific conductance less than 600  $\mu\text{S}/\text{cm}$  at 25°C hence the ground water is fresh and potable. About 45.16% of the samples located around the refinery area are having Sp. Conductance between 600- 2250  $\mu\text{S}/\text{cm}$  respectively. The specific conductance varies between 310  $\mu\text{S}/\text{cm}$  at 25°C at Vill-More Majra Bus stand and 1325  $\mu\text{S}/\text{cm}$  (Vill-Kutana).

### **Chloride Concentration**

The concentration of Chloride in all samples is less than 250 mg/l which is within the maximum permissible limit of BIS for drinking water purpose.

### **Fluoride Concentration**

The concentration of fluoride in majority of the samples (71.00 %) is less than 1.50 mg/l and remaining 29.03% located around the plant area show fluoride concentration above the permissible limit i.e. 1.5 mg/l. The min Fluoride Concentration of 0.36 mg/l is observed at Vill-Khandra and maximum concentration of 2.60mg/l is observed at Beshwal road.

### **Nitrate Concentration**

All the samples show nitrate concentration less than 45 mg/l, Nitrate is an anthropogenic pollutant.

### **Total Hardness**

The total hardness concentration in the ground water varies from 83 mg/l at Vill-Singhpura, and 347 mg/l at Vill-Dharamgarh.

### **Classification of Hardness**

This classification is based on the value of total Hardness. Ground water may be classified in to four type's soft, moderate hard, hard and very hard.

**Table: 2 Ground water samples summarised as per classification of Hardness**

S.No	District	Nos of Samples	Soft (0-60 mg/l)	Mod. Hard (61-120) mg/l	Hard (121-180) mg/l	Very Hard more than 180 mg/l
1	Panipat Refinery plant	31	00	04(12.90%)	09(29.03%)	18(58.06%)

As per the classification, the majority of Ground water is hard and very hard. None of the sample of in the study area are belongs to Soft category.

### **Sulphates (SO<sub>4</sub>)**

The sulphate content of ground water ranged between 1.0 mg/l to 201 mg/l at Vill-Khandra.

### **Heavy Metals**

Ground water samples are analyzed for six heavy metals viz Iron, Cadmium, Copper, Lead, Zinc and Manganese. The concentration of heavy metals is given in Annexure-4. The maximum and Minimum values are as follows:

#### **Minimum and maximum values:**

Parameters	Maximum permissible limits as per BIS standards (mg/l)	Minimum (mg/l)	Maximum (mg/l)
Iron	0.3	0.013	7.205
Cadmium	0.003	0.002	0.007
Copper	1.5	BDL	0.017
Lead	0.01	BDL	0.030
Zinc	5 to 15	BDL	1.890
Manganese	0.3	BDL	0.450

### **Iron Concentration**

The 48.38% of samples are having Iron concentration more than 0.30 mg/l which is beyond the standards prescribed by BIS for drinking water purpose. The Iron

concentrations varies between 0.013 mg/l sample no-3 (M/S Gulsan Garment Noorwala, gas godown, Panipat town) and **7.205** mg/l (Vill-Singhpura)

### **Cadmium**

Most of the samples (87%) are having the concentration of cadmium within desirable limits i.e.0.003mg/l. The cadmium concentration varies between 0.002 mg/l sample no-27(Vtsav garden, GT road, Gagbad-village.) and 0.007mg/l at (in the residence of Mahinder singh, opp. To CISF colony, Baholi.).

### **Copper**

In all samples, copper concentration is less than 0.05 mg/l. copper concentrations in these samples are within the standards by BIS for drinking water purpose.

### **Lead**

The most of the samples (84%) having lead concentration less than 0.010 mg/l. In five samples, lead concentration more than 0.01 mg/l is observed. The maximum 0.03mg/l concentration of Lead has been found in sample no-1 at Village Nizampur which is within the prescribed limit as per BIS.

### **Zinc**

The all samples have Zinc concentration within acceptable limit i.e.5 mg/l. None of the sample has Zinc value above the permissible limit.

### **Manganese**

The most of the samples having manganese concentration within permissible limit i.e.0.30 mg/l. Only one sample has manganese value above the permissible limit i.e.0.45mg/l (Vtsav garden, GT road Gagbad-vill.).

**Bacteriological Contamination:** Ground water samples from the Panipat refinery surrounding areas were collected by HSPCB and analysed for various parameters. The data is given in Annexure-3. As per the data, the COD values ranges between 7.20 mg/l to 40.80 mg/l. As per the BIS standards, drinking water should not have BOD and COD and thus the concentrations should have been zero. The presence of COD in ground water shows that the ground water is contaminated around the refinery area.

**Total Organic carbon:** Total Organic Carbon values range between 1.18 mg/l to 82.60 mg/l. All the samples collected around the refinery are having the TOC. However, no limit has been prescribed by BIS for TOC in drinking water. Presence of TOC shows the organic contamination of ground water.





19	Vill-Balwatan,sachin beauty salon.	H.P.	21	7.74	1240	586	43	18	15	2.9	0	8	35	189	4	10	163
20	Vill-Dharamgarh, vardha ashram,bus stand.	H.P.	45	7.47	1190	366	99	89	33	1.16	0	8	80	78	5.1	9	347
21	Vill-Khandra, Govt. middle school, bus stand.	H.P.	45	7.57	1090	195	156	201	29	0.36	0	20	50	161	6	7	255
22	Vill-Munak,Bus stand.	H.P.	36	7.5	885	488	21	9.6	12	0.86	0	8	27	145	4	2	133
23	Vill-Rer Kalan,Shiva temple.	H.P.	34	7.75	1030	488	57	47	1	0.65	0	12	37	157	5.2	9	184
24	Vill-Kutana,Gurunanak spare parts.	H.P.	27	7.54	1325	549	121	48	25	0.86	0	4	62	193	6	5	265
25	Vill- Begampur, Shiva temple.	H.P.	34	7.52	1050	515	99	10	50	1.51	0	4	55	172	5.5	11	235
26	Vill-Gudoh,Kashyap chopal.	S.B.	45	7.15	920	281	142	46	58	0.35	0	8	72	95	5.4	12	317
27	Vtsav garden, GT road,Gagbad-vill.	T.W.	34	7.41	510	244	85	37	19	0.71	0	4	60	52	6	8	255
28	Filling junction, Babarpur,G.T road.	D.T.W.	50	7.32	690	171	149	31	19	0.77	0	16	55	58	6	7	265
29	Vill-Ballaa,Gaoushalla .	D.T.W	56	8.17	590	305	14	29	12	0.4	0	45	30	32	5.2	13	235
30	Vill-More Majra Bus stand.	T.W	30	8.24	310	134	14	6.5	15	1.32	0	33	12	7.6	2.7	10	133
31	Vill-More Majra ,Water works.	D.T.W	91	7.89	575	207	43	54	18	1.2	0	45	30	30	4	12	235

## Annexure-3

Sample Results of Thirana Drain, Accumulated Surface Water in and around IOCL Green belt Area

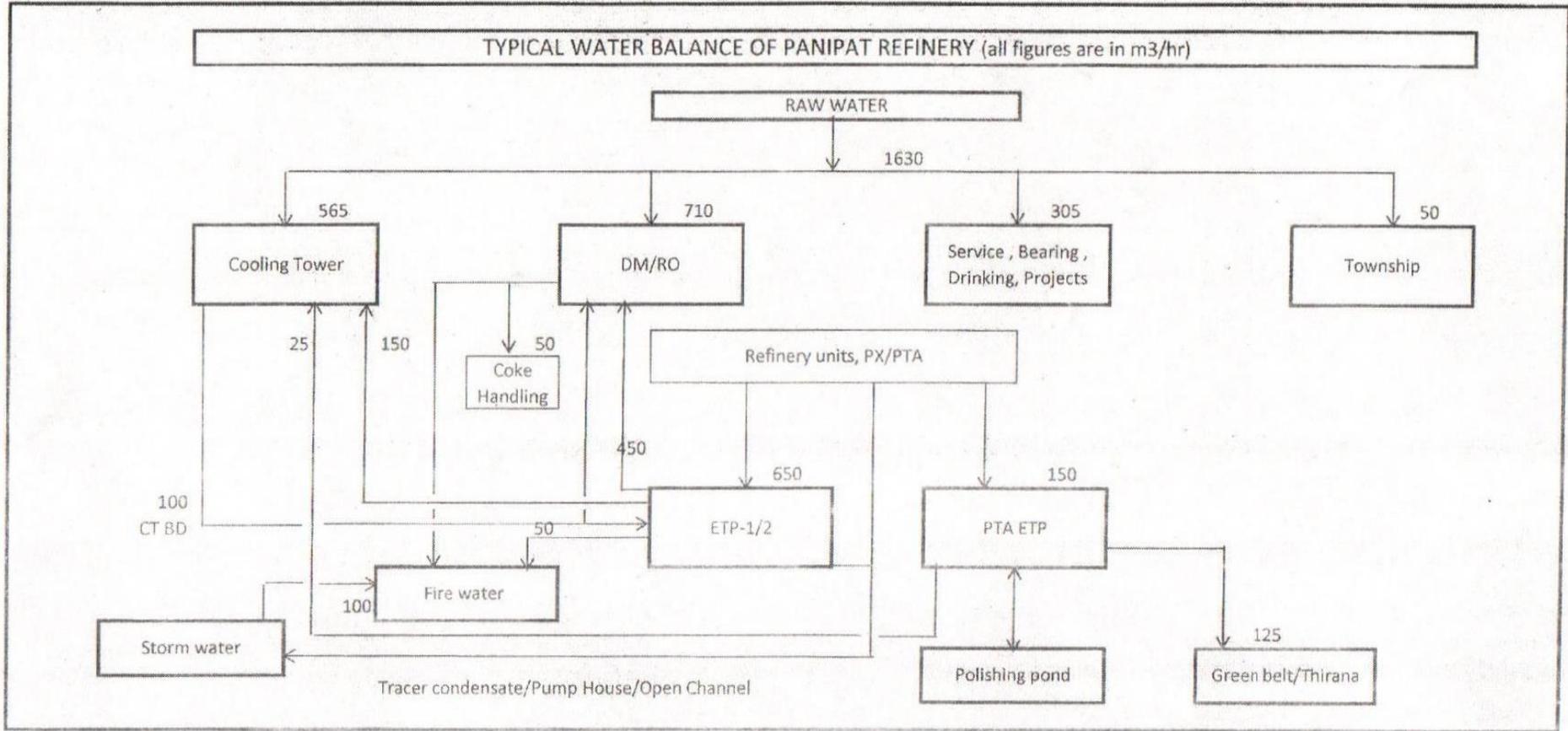
	Limit (*) mg/l	Limit (*) mg/l	Thirana drain near bridge Neptha gate 04.12.18	Stagnent water in plantation area 04.12.18	IOCL boundary green belt area opp. To FLM 109 04.12.18	Outlet pipe of ETP-III near culvert 04.12.18	Effluent discharge from green belt leading to Thirana (u/s) 04.12.18	Effluent discharge from green belt leading to Thirana (d/s) 04.12.18	Effluent standing in Green Belt leading to Thirana belt 04.12.18	Final outlet of ETP II 05.12.18	Final Outlet of ETP-I 05.12.18	ETP-III outlet at Thirana drain 05.12.18	Cess pool opp. FLM- 108 05.12.18	Outlet of ETP-IV 06.12.18
	ETP-I, II & IV	ETP-III												
pH	6.5-8.5	6.5-8.5	6.72	6.57	7.35	7.50	7.15	6.14	7.27	6.58	6.81	7.52	6.89	7.25
TSS	20	100	<b>124.0</b>	<b>552.0</b>	<b>252.0</b>	<b>202.0</b>	16.0	56.0	92.0	24.0	11.0	<b>142.0</b>	194.0	64.0
BOD	15	30	<b>102.0</b>	<b>1200.0</b>	<b>880.0</b>	<b>200.0</b>	50.0	60.0	52.0	48.0	21.0	<b>170.0</b>	900.0	10.0
COD	125	250	<b>360.0</b>	<b>3580.0</b>	<b>2872.0</b>	<b>662.4</b>	201.2	246.4	226.4	179.2	120.0	<b>460.8</b>	<b>5472.0</b>	64.4
Oil&Grease	5.00	10	6.0	16.0	13.0	5.0	4.0	4.0	ND	7.0	3.5	8.5	17.5	ND
Ammonical Nitrogen	15	50	10.64	8.96	4.48	7.28	4.48	6.16	5.04	8.4	ND	3.36	4.48	0.58
TDS	2000	2000	<b>1350.0</b>	<b>2520.0</b>	<b>2824.0</b>	<b>2010.0</b>	1580.0	1570.0	1730.0	900.0	1090.0	<b>2224.0</b>	3050.0	
Cond.			<b>2240.0</b>	<b>4190.0</b>	<b>4690.0</b>	<b>3340.0</b>	2620.0	2600.0	2870.0	1491.0	1807.0	<b>3680.0</b>	5070.0	<b>3042.0</b>
Fluoride	2.0	5.0	1.0	3.0	3.0	3.0	1.8	1.8	0.8	0.2	0.3	0.5	1.0	0.2
C6HSOH	0.35	<1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	1	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	5.0	2.0	0.041	0.075	0.065	0.044	0.070	0.057	0.062	0.077	0.080	0.051	0.086	0.035
Nickel	1	0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	3.0	3.0	5.661	8.370	2.598	1.816	1.794	1.866	0.852	0.437	0.484	0.406	2.806	0.064
Chrome	2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexa.Chrome	0.1	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.1	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.0	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphide	0.5	2	4.0	8.0	6.0	ND	ND	ND	1.2	0.4	ND	0.8	1.6	ND
Phosphate	3.0	5.0												ND

Standards has been taken as per EP Act,1986 for discharge of Environmental Pollutants from Panipat Refinery & Petro-chemical Complex and General standard for inland surface water parameter.Exceeding value of parameter has been shown in bold.

## Results of Handpump/ Borewell Water Collected from Villages Bohli, Singhpura (Sithana) and Dadlana

Parameter Unit : mg/L	Permissible Limit/ permissible limit in the absence of alternate source mg/l (*)	Hand pump Nersury neptha cracker glycol road 04/12	Hand pump near Sohan Lal dera Bohli 04/12	Hand pump House of Mulekhraj Baholi 04/12	Hand pump House of Munsil ram Baholi 06/12	Hand pump of Sh. Babu ram 06.12.18	Hand pump of Sh. Pawan 06.12.18	Hand pump of Sh. Ravi kumar near KBPL gate 06.12.18	Bohli CWF Hand pump 06.12.18	Submersible pump 06.12.18	Hand pump of sarpanch Kabri 06.12.18	Hand pump Singhpura 06.12.18	Handpump Dadlana 06.12.18
	↓ MR No →	5534	5534	5534	5534	5541	5542	5543	5544	5545	5546	5547	5548
pH	6.5-8.5	6.99	7.04	7.33	7.18	7.10	7.28	7.27	7.38	7.13	7.43	8.27	7.26
TSS	100	4.0	2.0	112.0	2.0	ND	ND	27.0	ND	ND	6.0	29.0	ND
BOD	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COD	250	40.8	24.4	76.8	17.6	12.8	8.8	7.2	20.0	18.0	14.0	12.8	14.0
O&G	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen	50/no relaxation	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TDS	500/2000	610.0	638.0	480.0	442.0	740.0	980.0	910.0	1420.0	1000.0	800.0	520.0	370.0
Conductivity	-	1005.0	1054.0	784.0	722.0	1233.0	1548.0	1461.0	2270.0	1667.0	1271.0	864.0	615.0
Chlorides	250/1000	124.0	50.0	52.0	22.0	26.0	104.0	132.0	126.0	62.0	30.0	30.0	17.0
Hardness	200/600	470.0	302.0	170.0	80.0	318.0	520.0	364.0	184.0	272.0	180.0	40.0	262.0
Calcium	75/200	88.0	56.8	40.8	40.0	84.0	72.0	46.4	21.6	44.8	20.8	8.0	47.2
Magnesium	30/100	60.75	38.88	16.5	19.4	26.2	82.62	60.2	31.59	38.88	31.1	4.86	34.9
Fluoride	1.0/1.5	0.8	1.3	2.1	1.4	0.3	1.0	1.0	1.0	1.0	8.0	8.0	0.2
Phenolic compound	0.001/0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphate	200/400	-	-	-	-	140.7	131.6	213.9	310.2	270	100.4	51.0	32.0
Copper	0.05/1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	05 or 15	0.531	0.454	0.887	0.104	0.047	1.096	0.204	0.294	0.066	0.072	0.559	0.029
Nickel		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	0.3/ no relaxation	1.329	1.468	25.167	1.020	0.491	0.268	0.180	0.320	0.009	0.766	1.732	0.071
Chrome	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexa. Chrome	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulphide	0.05/no relaxation	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Indian Standard Drinking water parameter, IS:10500:2012 and Exceeding value of parameter has been shown in bold.





20	Vill-Dharamgarh, vardha ashram, bus stand.	H.P.	BDL	0.014	BDL	0.010	0.577	1.239
21	Vill-Khandra, Govt. middle school, bus stand.	H.P.	BDL	0.007	0.164	0.005	0.053	1.180
22	Vill-Munak, Bus stand.	H.P.	BDL	0.005	BDL	BDL	BDL	0.178
23	Vill-Rer Kalan, Shiva temple.	H.P.	BDL	0.003	BDL	0.009	BDL	1.311
24	Vill-Kutana, Gurunanak spare parts.	H.P.	BDL	0.002	BDL	0.006	BDL	1.642
25	Vill- Begampur, Shiva temple.	H.P.	BDL	0.003	BDL	0.016	1.890	2.284
26	Vill-Gudoh, Kashyap chopal.	T.W.	BDL	0.002	0.165	BDL	BDL	2.925
27	Vtsav garden, GT road, Gagbad-vill.	T.W	0.002	0.001	0.451	BDL	3.175	BDL
28	Filling junction, Babarpur, G.T road.	T.W.	0.003	BDL	BDL	BDL	BDL	0.394
29	Vill- Ballaa, Gaoushalla.	T.W	BDL	0.004	BDL	BDL	BDL	0.164
30	Vill-More Majra Bus stand.	T.W	BDL	0.017	BDL	BDL	BDL	0.104
31	Vill-More Majra , Water works.	TW	BDL	0.002	BDL	BDL	BDL	0.232

**TOC data of ground water samples  
around Panipat Refinery**

Annexure-5

Sample No	Unique ID	District	Location	Source	TOC (NPOC) mg/l
9	1TOC	Panipat	Vill-Dadlana, near water tank.	H.P.	15.35
10	2TOC	Panipat	Vill-Dadlana,PHE, T.W.	T.W.	2.270
11	3TOC	Panipat	Mahinder singh S/O Shri Sadhuram,CISF colony,Baholi.	H.P.	52.26
12	4TOC	Panipat	Mahinder singh S/O Shri Sadhuram ,CISF,colony,Baholi.	Tubewell	82.60
13	5TOC	Panipat	Naphtha creeker, glycol road nursery.	H.P.	21.25
14	6TOC	Panipat	Ravi kumar ranga,KBPL gate,Phool singh dera.	Tubewell	37.64
15	7TOC	Panipat	Pawan s/o Pale ram, near railway line,Baholi.	H.P.	0.72
16	8TOC	Panipat	Munsiram,sohanlal dera,Inside Railway line,Baholi.	H.P.	2.19
17	9TOC	Panipat	Vill-Singhpura,Satpal sarpanch dera,Babadargha	H.P.	47.11
18	10TOC	Panipat	Vill-Singhpura,NC plant 6km,Rotashpal sweet.	H.P.	46.45
19	11TOC	Panipat	Vill-Baljatan,sachin beauty salon.	H.P.	31.04
20	12TOC	Panipat	Vill-Dharamgarh,wardha ashram,bus stand.	H.P.	44.19
21	13TOC	Panipat	Vill-Khandra, Govt. middle school, bus stand.	H.P.	45.51
22	14TOC	Panipat	Vill-Munak,Bus stand.	H.P.	1.18
23	15TOC	Panipat	Vill-Rer Kalan,Shiva temple.	H.P.	1.33

Sample No	District	Block	Location	Source	COD mg/l
9	Panipat	Panipat	Vill-Dadlana, near water tank.	H.P.	14
11	Panipat	Samalkha	Mahinder singh S/O Shri Sadhuram,CISF colony,Baholi.	H.P.	20
13	Panipat	Samalkha	Naphtha cracker, glycol road nursery.	H.P.	40.8
14	Panipat	Samalkha	Ravi kumar ranga,KBPL gate,Phool singh dera.	H.P.	7.2
15	Panipat	Samalkha	Pawan s/o Pale ram, near railway line,Baholi.	H.P.	8.8
16	Panipat	Samalkha	Munsiram,sohanlal dera,Inside Raily line,Baholi.	H.P.	24.4
17	Panipat	Madlauda	Vill-Singhpura,Satpal sarpanch dera,Babadargha	H.P.	12.8

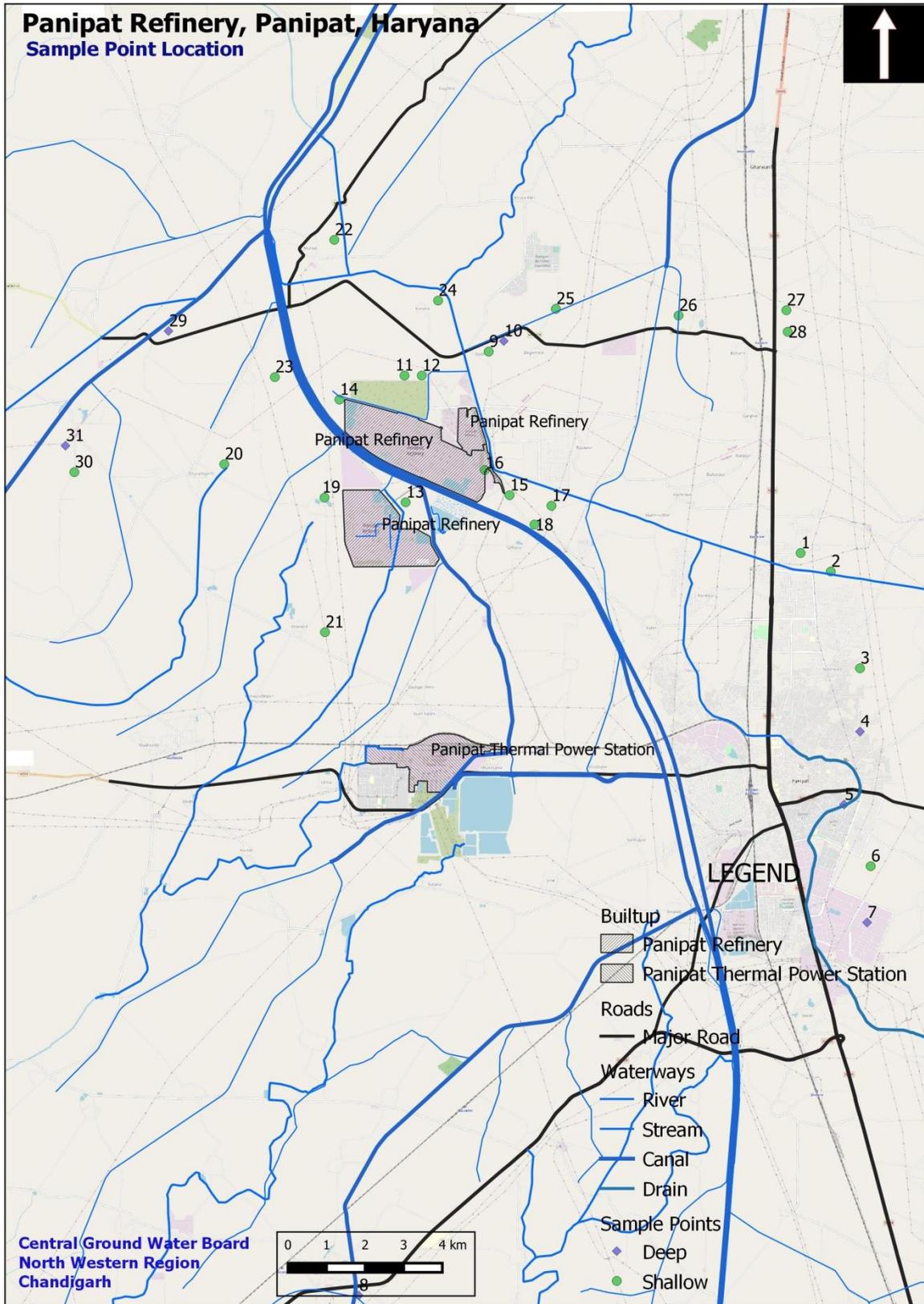


Fig 1: Location Map of Sampling points

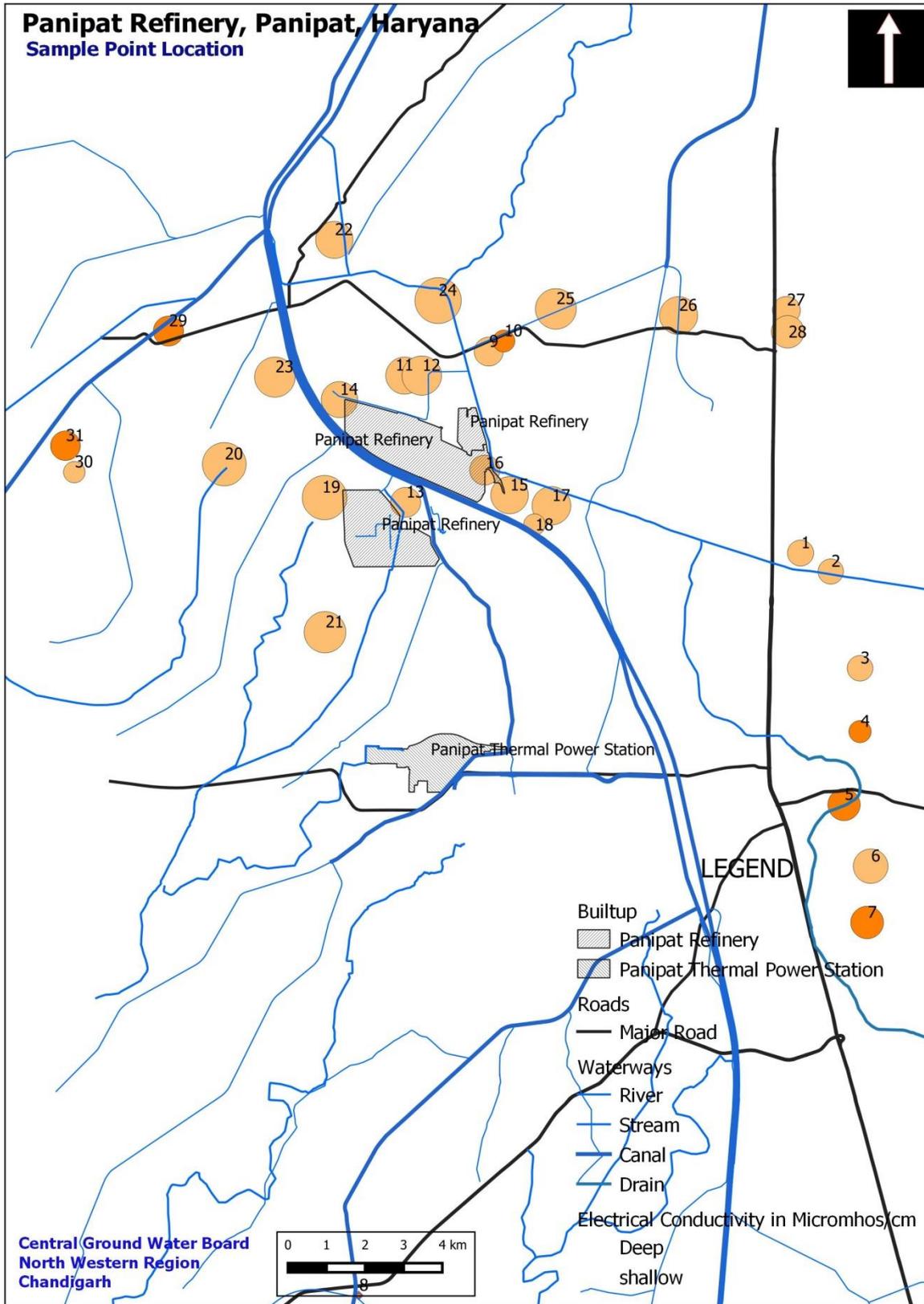


Fig 2: Electrical Conductivity (E.C.) of Ground water

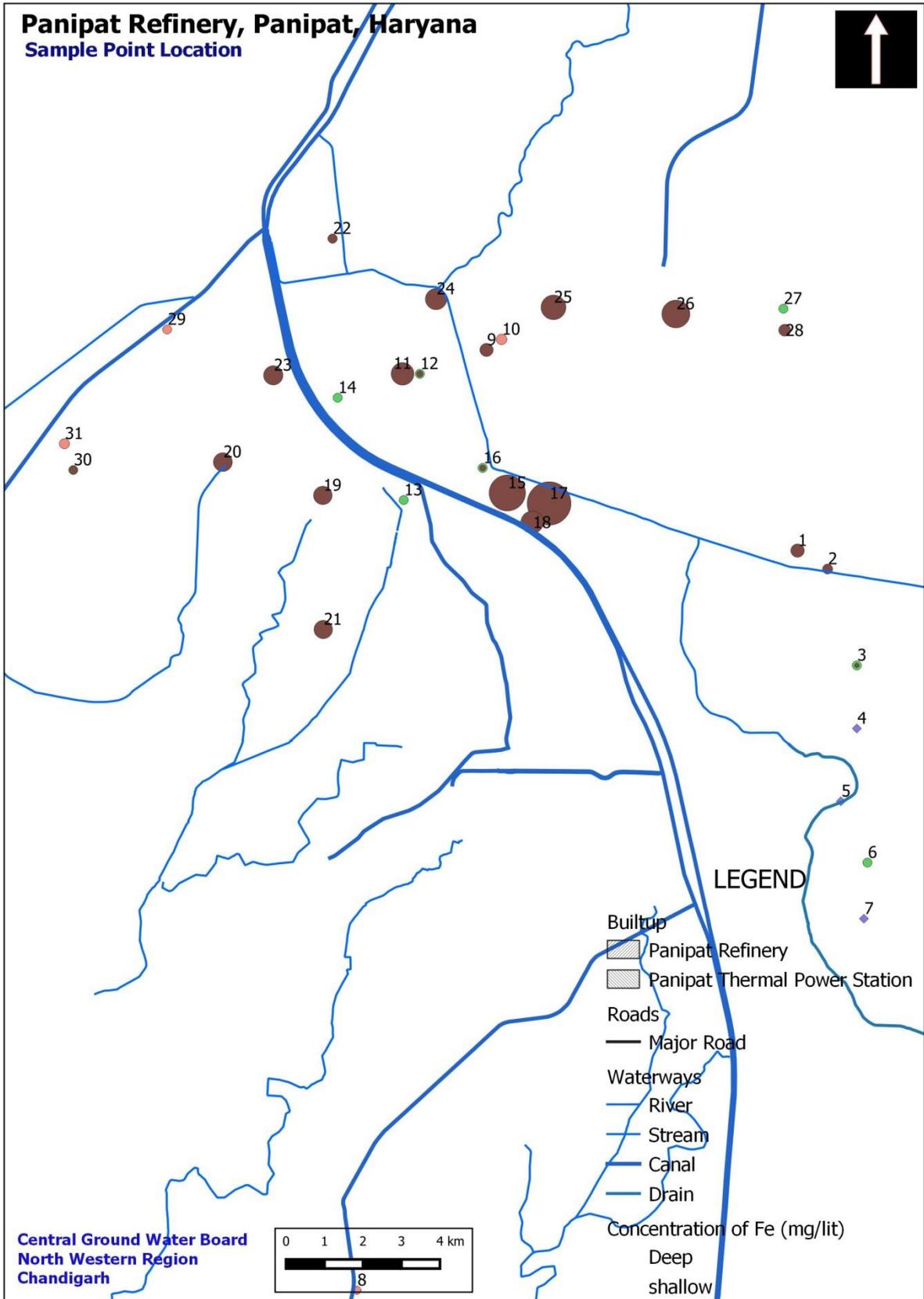


Fig 3: Concentration of Iron

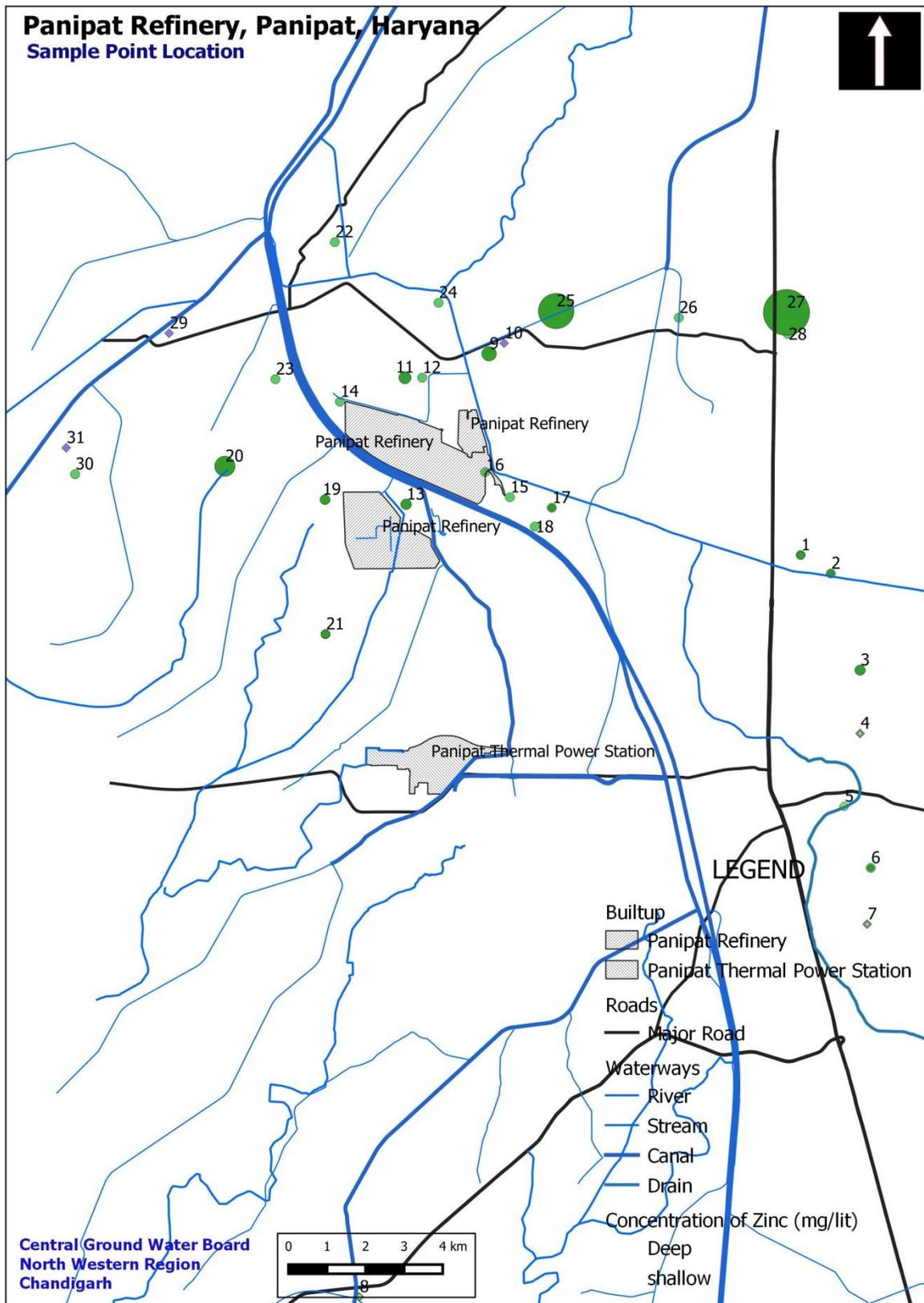


Fig 4: Concentration of Zinc

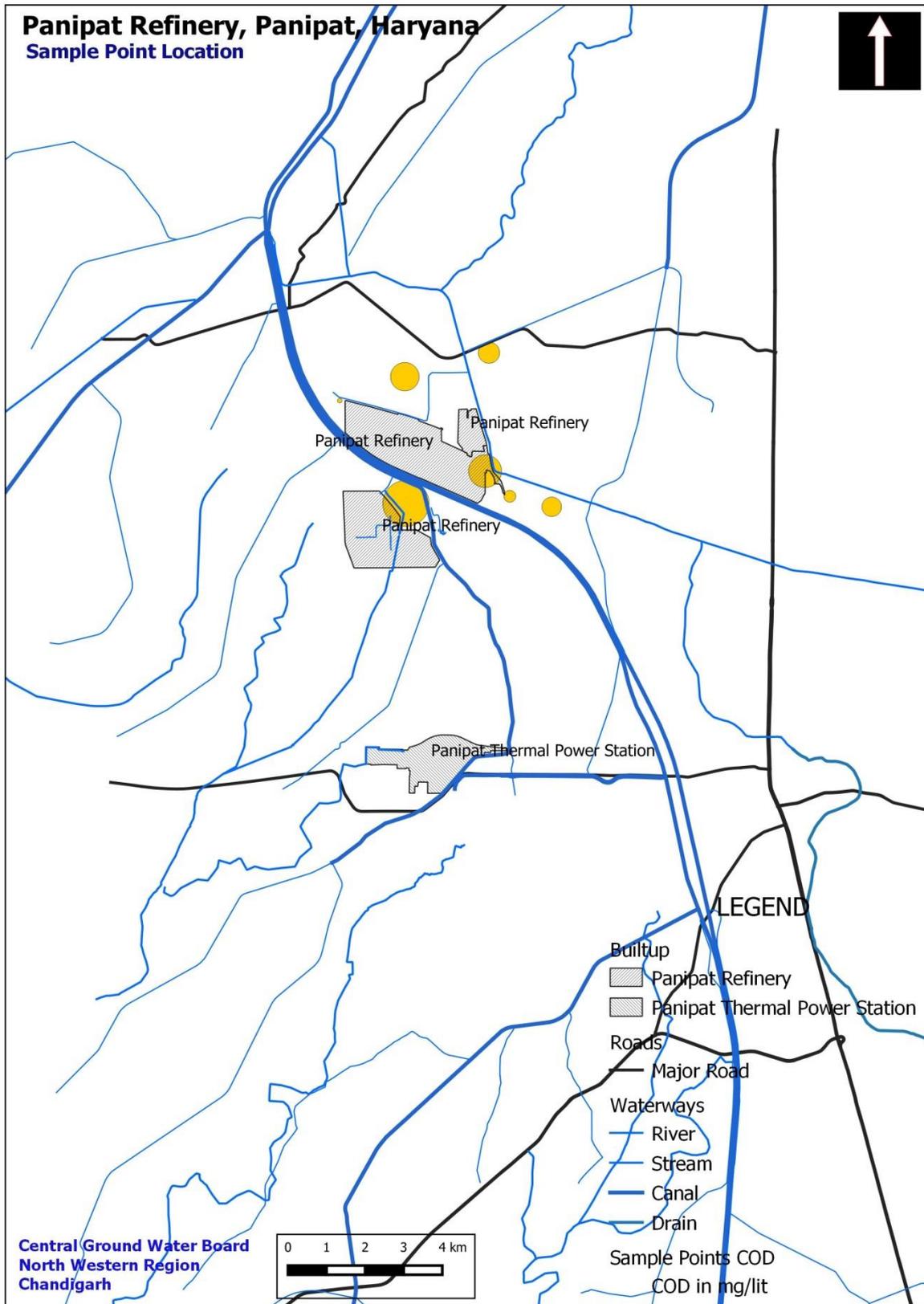


Fig 5: Concentration of Chemical Oxygen Demand (COD)

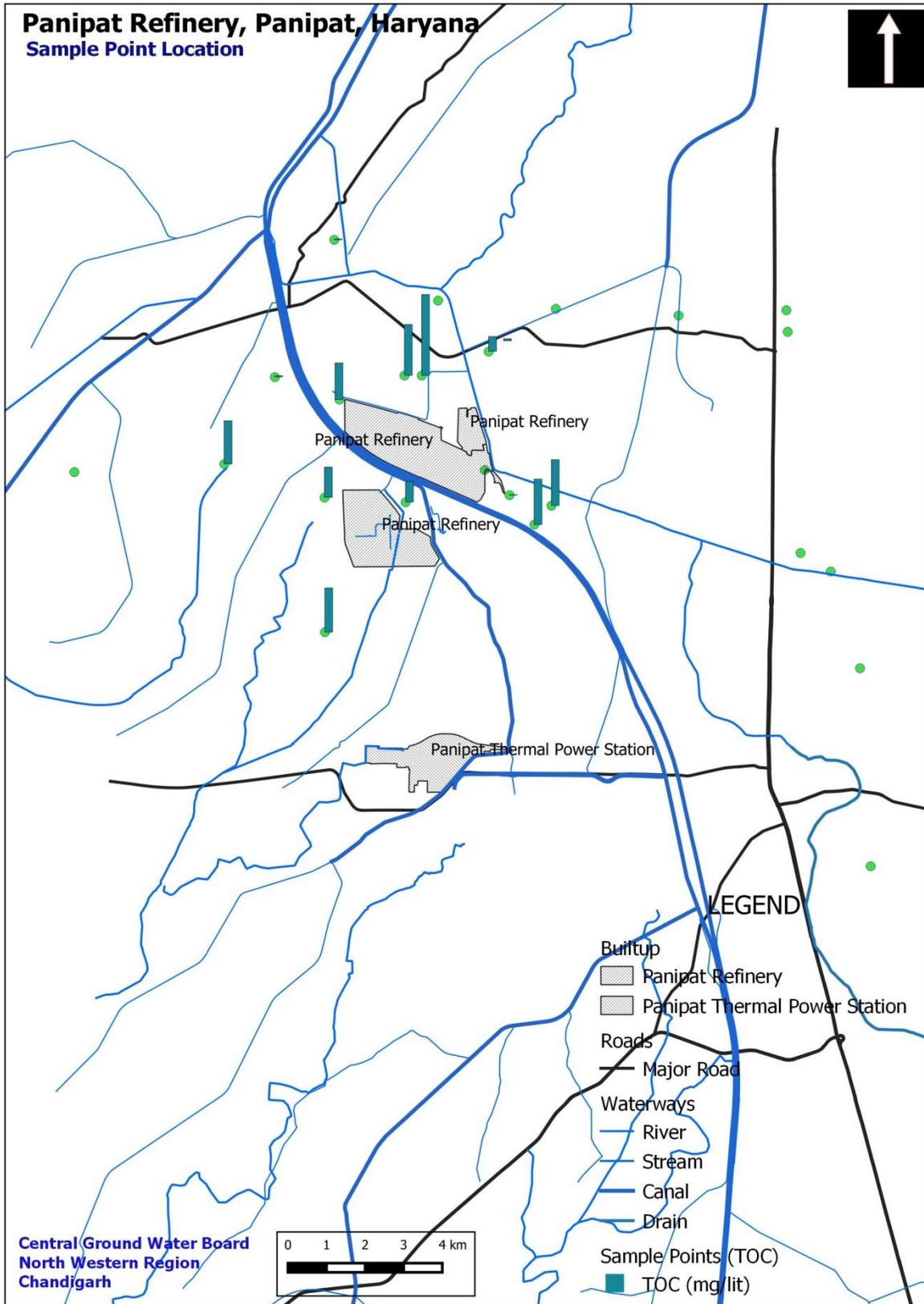


Fig 5: Concentration of Total Organic Carbon (TOC)

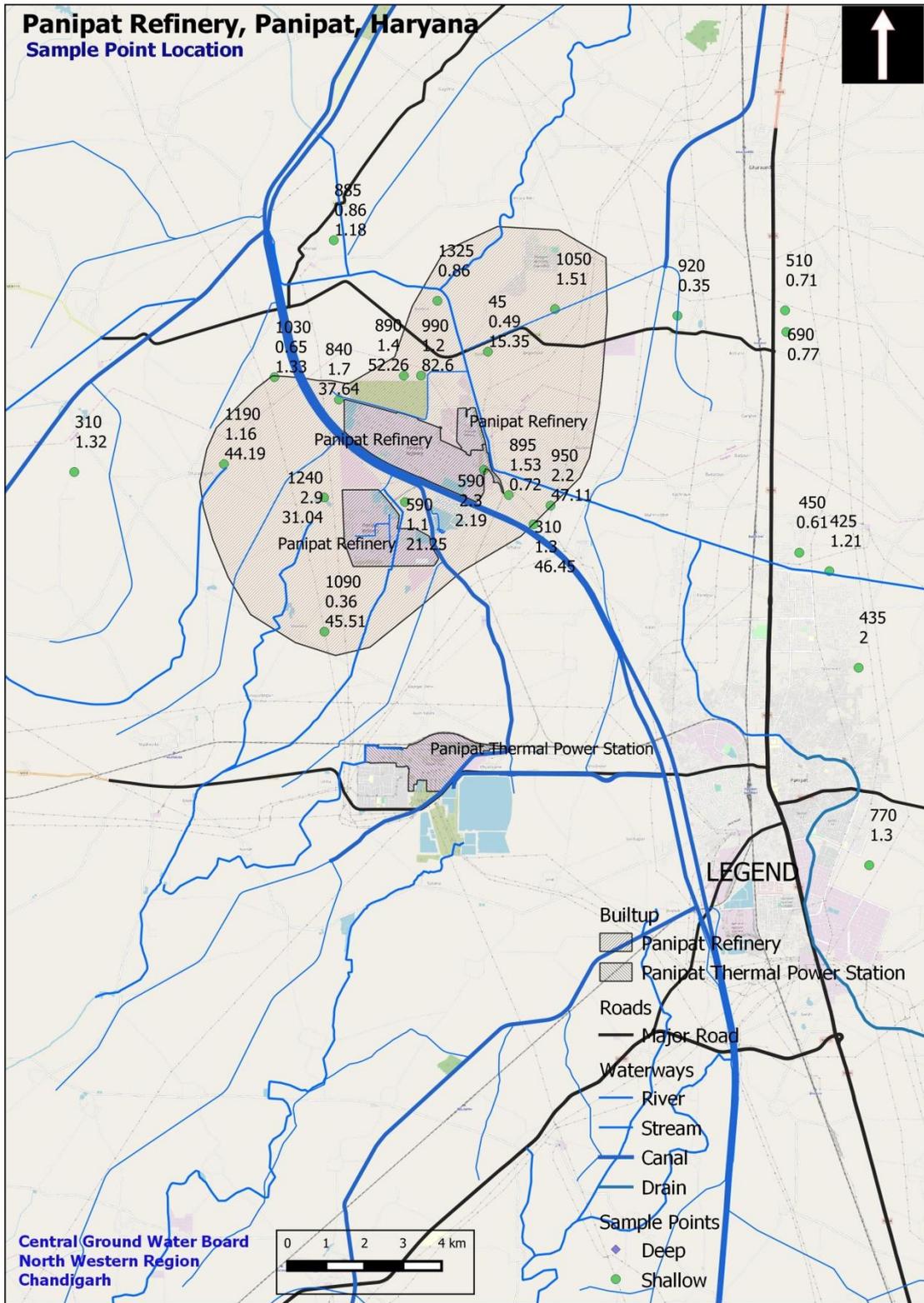


Fig 6: Demarcation of ground water contaminated zone around Panipat Refinery Complex based on Electrical Conductivity, Iron and Total Organic Carbon





Rajesh Garhia &lt;hspcbsrscientist@gmail.com&gt;

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**Re: EIL report in the matter of IOCL, Panipat Refinery, Panipat.**

1 message

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**Narender Sharma** <narendersharma.cpcb@gov.in>

Wed, Nov 20, 2019 at 7:09 AM

To: hspcbsrscientist &lt;hspcbsrscientist@gmail.com&gt;

Cc: ms kumar &lt;ms\_kumar@neeri.res.in&gt;, rdnwr-cgwb@nic.in, Deputy Commissioner Panipat &lt;dcnpn@hry.nic.in&gt;, ADC Panipat &lt;adcnpn@hry.nic.in&gt;, mohiddin sk &lt;mohiddin.sk@nic.in&gt;

**Confidential and For Circulation to only and only Members of the Joint Committee and Expert Members**

Dear Sir,

Pls refer to the MOM signed by you, DC and ADC, Panipat asking for comments on EIL Report from the Expert Members ( Copy Attached). Pls note that clarifications sought by other committee members have already been explained technically by the CPCB Member during the meeting but unfortunately not included in the Minutes of meeting.

As mentioned in my previous email that we are not supposed to give comments on the draft observations of EIL on the reports of the Experts engaged by the Joint Committee constituted as per orders of Hon'ble NGT in this matter. It is like helping someone to prepare a report against the report of the Joint Committee prepared for submission to the Hon'ble NGT. Pls note that EIL has been/is involved in providing Engineering, Procurement and Construction Management (EPCM) services to refineries and recently been awarded a contract of 30 Crores by IOCL for its expansion activities. EIL is an interested party and there could be conflict of interest and whole committee should not be held accountable in case of any dispute, at any stage. As explained during the meeting it will be highly unethical on our part to share and discuss the confidential reports of the experts with a consultant of the Industry against whom the investigation is going on, under the supervision of Hon'ble NGT and that too before submitting the report to NGT, which is ready for the past few months. It will be even more serious concern if we influence our report by considering the observations of the consultant of the industry and it may be seen as serious violation of NGT's Order. The reports have been prepared by individual experts ( CPCB, CSIR-NEERI and CGWB) as required by Joint Committee, based on reports of the Joint Committee comprising members of District administration, HSPCB and CPCB), past data and the information provided by HSPCB, IOCL and District Administration, additional data generated by collected samples of ground water and scientific evaluation. These reports can be defended by these agencies if required to do so by Hon'ble NGT but not by EIL. However, as requested by CGWB expert in the trailing email, you may kindly provide approval of Hon'ble NGT for seeking observation of the Consultant of IOCL, before submission of the Report to Hon'ble NGT.

**You may mention in the final report that comments were asked on EIL's Observations from CPCB Member and he has replies as under ( Pls reproduce my views as explained above)**

--

**With regard to finalization of the report for submission to Hon'ble NGT, you are requested to kindly refer to the MOM of the Joint Committee dated 20/9/2019 and your letter to DC, Panipat dated 13/9/2019, which clearly say that:**

Draft report was circulated to members on August 6, 2019 and CPCB member submitted his comments acceptance of the report subject to incorporation of the comments on August 9, 2019; The CPCB Member is in agreement with the conclusions of CSIR-NEERI and CGWB; The final Draft report circulated by Nodal Officer was accepted by CPCB Member on 13/8/2019; Nothing is pending with CPCB Member which could delay the submission of the Report to NGT.

CPCB Still stand by his report and the report circulated by the Nodal Officer and hence no further comments are required.

**However, during meeting on 14/11/2019 in the Office of DC, Panipat , it was desired by the Committee to elaborate some points to strengthen the final report and accordingly the following should be included in the conclusion part of the Final Report:**

Grab Samples were collected by HSPCB Team under Water Act as per Law under the direct supervision of Joint Committee constituted in this matter as per orders of Hon'ble NGT, by issuing proper notice to the representatives of the Industry.

This is to emphasize here that firstly it was illegal discharge without any consent to operate for such disposal in the thirana drain and secondly no industry could be allowed to discharge beyond prescribed limits in water body even for short duration since the loss to water life is irreparable, one done by such act. It may also be noted here that effluent in thirana drain was being discharged from the storage tank after the ETP and not directly from ETP which itself shows that average values of parameters were on much higher side than prescribed beside being illegal discharge.

It may also be noted that the industry was discharging effluent not only from this point reported in the 1st report of the Joint Committee but two other points i.e one directly in the thirana drain and another into the Drain No 2 leading directly to Yamuna drain. The flow of effluent considered is 255 m<sup>3</sup>/h. Flow of Effluent was also estimated from pipe size and was coming to much higher side and hence was restricted to the volume indicated in the water balance/Consent of the Industry, for calculation of the damage. Diameter of three pipe lines which were found to be used for discharging were 8 inch, 6 inch and 18 inch.

OCEMS installed in the Industry was studied in detail by the Joint Committee and the finding of the Joint Committee as reported in the 1st Report of the Joint Committee to Hon'ble NGT is reproduced as under: "The Online Continuous Emission Monitoring System (OCEMS) installed for real time monitoring was checked for its accuracy by using a standard reference solution of known COD of 70 ppm. The OCEMS system installed by Panipat Refinery showed value of 69.5 ppm for the sample of known COD of 70 ppm and hence found to be accurate and calibrated. However, the samples collected for analysis from the outlet of ETP and from Thirana Drain were found to be non-complying with the prescribed norms which indicate that effluent streams used for online monitoring may not be the same as the final outlet of ETP. **Therefore, sensors of Online Continuous Effluent Monitoring system need to be installed directly and immediately into the final discharge rather than taking one small pipe line to a room for OCEMS as presently being done by the Unit, to prevent tempering of the representative discharge sample.** The State Pollution Control Board needs to issue directions to the Unit in this regard."

It was also concluded by the Committee that "the Online Analyzers provided by the unit for monitoring of treated effluent quality and for air emission was found in working condition and transmitting real time data to CPCB / HSPCB server. However, the samples collected for analysis from the outlet of ETP and from Thirana Drain were found to be non-complying with the prescribed norms whereas results of the stream diverted to OCEMS in a room was found to be complying with norms as per values recorded in OCEMS, *which indicates that effluent stream used for online monitoring may not be the same as the final outlet of ETP. Therefore, sensors of Online Continuous Effluent Monitoring system needs to be installed directly into the final discharge rather than taking one small pipe line to a room for OCEMS as presently being done by the Unit, to prevent tempering of the representative discharge sample.* **In view of this, the joint Committee decided not to consider historical data of OCEMS.**

Legal samples collected by the Joint team were analysed by notified Board's analysis. There is also a provision in the Act, which permits the Industry to request for one parallel sample drawn by the HSPCB Team sealed, for getting it tested from approved Laboratory through State Pollution Control Board. The industry could have done it at that point of time. They were asked by the Joint Committee while issuing notice but Industry didn't opt for this. Similarly, villagers were also asked by the Joint Committee if they want to send the parallel hand pump samples to another lab but they also didn't opt this option.

It was informed during the meeting of the Joint Committee held on 14/11/2019 that HSPCB has now granted permission to IOCL for discharging effluent in the thirana drain which ultimately, meets the Yamuna River. This means that Illegal discharge of Effluent in the thirana drain as reported by Joint Committee comprising members of HSPCB, DC, Panipat and CPCB, has been legalized. The HSPCB may be asked to share the study done to establish the environmental carrying capacity of thirara drain and Yamuna river to ensure the water and air ecosystem are not affected from discharge of industrial effluent of PTA plant which not only contains BOD and COD but heavy metals as well. This becomes more important in view of the fact that the water from the Yamuna river is not only used for crops but also for growing vegetable which are eaten raw by human population.

The HSPCB should get the "ZLD" or "Recycle & Reuse" implemented in true sense as per definition approved by Hon'ble NGT. Effluent used for plantation/irrigation can not be considered ZLD or Recycle & Reuse. For using effluent which are hazardous in nature and contains heavy metals, the carrying capacity of the soil, ground water and crops must be conducted before allowing use of such effluents for plantation of irrigation.

Lastly, the damage caused to the public health and ground water was attributed to Panipat without considering the need of Source apportionment on account of the following reasons: No other industry exists in the affected area ; No industry in the affected area is discharging effluents illegally in the drain for years; Industry has created earthen lagoons covering hectares of land for storing treated and untreated waste water without arrangement of capturing VOC, No arrangement has been made to prevent release of VOCs in the

Environment; OCEMS installed for treatment was found to be mastered, No dilution is available in the open thirana drain were industry is discharging effluent and so on.

My apologies for typo errors, if any. I'll correct that same in the final report, if shared by Nodal Officer before submission to Hon'ble NGT.

Regards

Narender

**From:** "mohiddin sk" <[mohiddin.sk@nic.in](mailto:mohiddin.sk@nic.in)>

**To:** [hspcbsrscientist@gmail.com](mailto:hspcbsrscientist@gmail.com), "ms kumar" <[ms\\_kumar@neeri.res.in](mailto:ms_kumar@neeri.res.in)>, [rdnwr-cgwb@nic.in](mailto:rdnwr-cgwb@nic.in), "Deputy Commissioner Panipat" <[dcpnp@hry.nic.in](mailto:dcpnp@hry.nic.in)>, "ADC Panipat" <[adcnpnp@hry.nic.in](mailto:adcnpnp@hry.nic.in)>, "Narender Sharma" <[narendersharm.cpcb@gov.in](mailto:narendersharm.cpcb@gov.in)>

**Sent:** Tuesday, November 19, 2019 11:28:18 AM

**Subject:** Re: Fwd: EIL report in the matter of IOCL, Panipat Refinery, Panipat.

Sir,  
The decision regarding seeking the comments of EIL on experts reports of CPCB, NEERI and CGWB has been taken by the committee constituted by the Hon'ble NGT. If so in which meeting this decision has been taken and please forward the minutes of the said meeting. Whether the decision to seek the comments on experts report from EIL is put before the Hon'ble NGT.

The above clarifications may be forwarded immediately to take a decision to prepare clarifications on EIL report.

S K Mohiddin,  
Sr. Hg (Scientist), CGWB, Chandigarh.

On 11/16/19 04:05 PM, **Rajesh Garhia** <[hspcbsrscientist@gmail.com](mailto:hspcbsrscientist@gmail.com)> wrote:

As per the the meeting of the the joint committee held on 15 11 2019 in the the office of deputy commissioner Panipat the observations of the the Engineers India Limited are hereby forwarded to you for your valuable comments on the Damage assessment reports of cpcb member , CSIR -NEERI member and CGWB member with in two days so that report may be finalized accordingly and submitted to Honable NGT.

----- Forwarded message -----

From: **Rajesh Garhia** <[hspcbsrscientist@gmail.com](mailto:hspcbsrscientist@gmail.com)>

Date: Fri, 15 Nov 2019, 1:46 pm

Subject: EIL report in the matter of IOCL, Panipat Refinery, Panipat.

To: Narender Sharma CPCB <[narendersharm.cpcb@gov.in](mailto:narendersharm.cpcb@gov.in)>

Please find the attachment.

--  
**Rajesh Garhia, Sr. Scientist,  
Haryana State Pollution Control Board (HQ),  
Panchkula**

--  
**With Regards,**  
S K Mohiddin,  
Scientist, CGWB  
Ministry of Water Resources, RD & GR  
West Block-2, R.K. Puram, New Delhi  
Ph: 011-26175316; Fax: 011-26175369  
email: [mohiddin.sk@nic.in](mailto:mohiddin.sk@nic.in),  
<http://www.cgwb.gov.in>



From

Deputy Commissioner,  
Panipat.

To

The Nodal Agency,  
HSPCB,  
Panchkula.

No.

2156 / PA / Camp. dated :- 20/11/2019

**SUB: Final Report of the Joint Committee constituted by Hon'ble NGT vide Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery in Compliance of Hon'ble NGT Order dated 01.03.2019 and 10.05.2019**

This is in continuation to my letter no. 273/PA dated 04-10-2019 (Copy enclosed) vide which, I had requested to seek six week time from Hon'ble NGT as the District Administration required assistance of independent expert agency to examine and understand the technical details and the issues in various reports as submitted by CPCB, NEERI & CGWB before submitting the final report.

Our detailed observations and comments are enclosed herewith for your kind perusal and inclusion of the same in the Final Report of the Joint Committee constituted by Hon'ble NGT vide Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery in Compliance of Hon'ble NGT Order dated 01.03.2019 and 10.05.2019.

Submitted for your kind information and further necessary action, please.

  
Deputy Commissioner,  
Panipat.

Encl. As above.

**Final Report of the Joint Committee constituted by Hon'ble NGT vide Order dated 15/11/2018 in OA No.738/2018, in the matter of Satpal Singh & Others Vs IOCL, Panipat Refinery in Compliance of Hon'ble NGT Order dated 01.03.2019 and 10.05.2019.**

Apropos the Minutes of the meeting dated 20.09.2019 (Annexure-I) , the undersigned had requested to seek time of six weeks from Hon'ble NGT so that the district administration could seek expert advice from other agencies in order to understand the intricacies of the reports as submitted by CPCB , NEERI for surface water and CGWB for assessment of damage and cost of restoration w.r.t. Oxygen depletion and Pollution caused to the surface water due to illegal discharge of effluent by CPCB Member, Assessment of damage caused to the public health and environment (CSIR NEERI), Assessment of damage caused to the ground water and cost of restoration (CGWB Member).

Proceeding with that decision district administration Panipat wrote to IIT Roorkee, NIT Kurukshetra and Engineers India Limited on 27.09.2019, to which EIL responded positively. EIL then met the district administration and sought all the reports for their expert analysis and report. The report by EIL was received on 22.10.2019. In their report EIL highlighted many important issues which should be considered positively along with reports by CGWB, NEERI and CPCB before reaching to any further conclusion on environmental damage. As per observation by EIL based on record provided to them IOCL has the permission to discharge the treated effluent into Thirana drain up to the limit of 255m<sup>3</sup>/h. Fresh sampling was not done by the expert team to reach to the conclusion that the discharge into

Thirana drain does not meet the prescribed standards. Multiple samples at various locations could have been taken to eliminate chances of any possible error instrumental or human. EIL has strongly recommended Source Apportionment study to conclude all possible factors which might be responsible for such environmental damage. As observed by EIL in their report refinery does not conclude to PM<sub>10</sub> level rise in ambient air. Source for such rise can be agricultural activities or vehicular emission etc. Report by EIL is placed at **Annexure-II** and the comments by district administration Panipat on the EIL report are placed below:

**Comments of District Administration :**

1. **IOCL PRPC does not have permission to discharge treated effluent (from PTA) in Thirana Drain:**

As per available record perused by EIL, IOCL PRPC has the required permission to discharge the treated effluent in Thirana Drain up-to the limit of 255m<sup>3</sup>/h. There has been no amendment to EC/CTO or any other document and also in the maximum limit of discharge of treated effluent in Thirana Drain. In any case, HSPCB vide CTO dated 25.07.2019 have granted permission to discharge treated effluent into Thirana drain as originally envisaged. As per letter HSPCB/2000/1/3 dated 11.08.2000 "the unit will ensure that treated effluent discharge into Thirana drain shall conform to standards laid down by HSPCB and should not deteriorate the quality of river Yamuna".



2. **The treated effluent (from PTA) being discharged to Thirana Drain does not meet the prescribed discharge standards:**

As observed by EIL, the method of sampling needs reconsideration as per standard sampling methods i.e. Grab sample or Composite sample. In the report it is not clear what method of sampling was carried out by the team. Also, the expert agencies hired had done their studies based on sampling done in Dec, 2018 by the joint committee. No fresh sampling was made to reach out to conclusions. Real time data of OCEMS is transmitted and monitored by CPCB/HSPCB. No historical records of OCEMS data were taken into account in the report. This past data used as a part of routine environment clearance monitoring should also be complimented. As suggested by EIL, multiple samples from various locations could have been taken and analysed in different labs to eliminate any chances of error (human/monitoring/analysis/ equipment).

3. **The treated effluent (from PTA) being discharged to Thirana Drain and Cess Pool Water have polluted the surface and ground water:**

There may be various factors responsible for over-the-time degradation of quality of ground water. Those sources/ factors needs to be reconsidered. Also, to reach quantitative conclusion of damage caused to ground water some base line data shall be used for comparison i.e Data available before the establishment of Refinery. Other factors like seasonal variations, industrial and agricultural activities in that area cannot be neglected while calculating the damage. EIL has strongly recommended that a 'Source Apportionment Study' should be carried out. A study carried out by TERI for

IOCL when compared with NEERI EIA Report, 1993, showed no deterioration in ground water quality.

4. **VOC Emissions from PRPC is polluting the ambient air quality in the surrounding villages:**

Results of spot sampling of refinery and petrochemical stack emissions and Ambient Air Quality monitoring during the joint committee visit from period 04.12.2018 to 06.12.2018 were within permissible limits. PM10 levels of nearby areas were found to be higher than the permissible limits. As per Eil's observation the same cannot be attributed to refinery. Refinery doesn't contribute to PM<sub>10</sub> level. Agriculture, vehicular emissions etc are major source for PM<sub>10</sub> level in the air. As per monthly compliance report by refinery to HSPCB M/s NEERI is conducting a source apportionment study to identify the root cause of high Particulate matter in ambient air in and around Refinery premises. Also VOC system is under installation and same would be commissioned by July 2021 as mentioned by Refinery in the monthly compliance report to HSPCB.

5. **Stagnant effluent (cess pool) due to accidental leakage of untreated effluent have polluted the ground water :**

Cess pool was observed by team in their visit to Refinery in Dec, 2018. It was reported that the cess pool was because of accidental leakage due to breakage of a pipe when a JCB cut an underground pipe accidentally, probability of which cannot be brushed away in such a large Refinery. The same was found to be restored in further visits to the Refinery. As

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suggested by EIL an action plan may be devised to restore such localized damage caused to soil or green belt in case of any exigency in future.

A valid solution can be Green Belt Development. A 7 hectare green belt development is under progress in Refinery.

Fresh consolidated time average samples at those points which shows large variations and their analysis at three different accredited labs will dispel this ambiguity as suggested by EIL.

**Way forward:**

1. District administration agrees with EIL report and strongly back that a Source Apportionment Study shall be carried out to finalise the various causes and factors responsible for degradation to the environment so that a wholesome plan can be prepared to mitigate such activities/factors in future. The whole onus of environmental degradation shall be a shared responsibility of the society which can be ascertained by such source apportionment study. This can be a lynchpin study to strengthen the efforts of various agencies including Pollution board Haryana, CPCB and IOCL to mitigate environmental pollution. Therefore source apportionment study to be conducted by IOCL should focus not just on Air Quality but also on the Ground and Surface water. The State Pollution Control Board should monitor closely the status of source apportionment study. The study should be completed within next six months by IOCL.

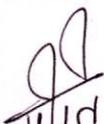


2. Since CGWB has submitted the assessment of Qualitative & Quantitative damage to the ground water, now the State Government may further get the study done w.r.t to plan for restoration of ground water quality based on the usage schedule of the ground water in Panipat area, in consultation with district administration, State pollution control board and other concerned departments, to ensure ill effects of contaminated ground water on the health of local people. The cost of restoration would be finalized after appropriate study for restoration of ground water quality based on the usage schedule of the ground water in Panipat area by State Govt. As proposed in report of CGWB Engineering feasibility of dewatering and refilling of aquifers, as proposed in the report of CGWB, shall be relooked for its environmental implications.
3. The report on the action taken for restoration of ground water quality be submitted to NGT, CPCB and State government on quarterly basis by the IOCL. IOCL may be directed to provide safe drinking water to nearby villages affected by Drinking Water quality issues till the restoration of the ground water quality
4. Extensive rainwater harvesting may be more sustainable solution to restore the quality of groundwater. Panipat on an average receives 600mm of rain annually. If the same can be harvested in an efficient way, the same can prove to restore the quality of groundwater in lesser time and cost with no further environment implication.

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5. Green Belt Development is another sustainable solution to the Environmental Issues over the decades. Yearly targets and monitoring of them can give long term sustainable solutions. The action to be taken by the IOCL should be monitored quarterly, quantitatively and qualitatively by the District Administration and State Pollution Control Board.
  
6. Water stored in multiple lagoons/ponds inside the plant should be treated and recycled before lining the lagoons to make these lagoons impervious as mandated in COT dated 25-07-2019. Further No untreated water will be stored in the lagoons/ponds except in the tanks, which are components of effluent treatment plant.

  
9/10/2019  
**Preeti, IAS**  
**ADC, Panipat**

  
**Sumedha Kataria, IAS**  
**DC, Panipat**

Date: 22.10.2019

IOCL's Panipat Refinery & Petrochemical Complex (PRPC) is located in Baholi village of Panipat district. A complaint was sent by Sarpanchs of Gram Panchayats (vide letter dated 4.9.2018) to the Hon'ble National Green Tribunal (NGT) related to air and water pollution in surrounding villages due to PRPC operation. While acting upon the complaint, NGT vide its order dated 15.11.2018 directed constitution of the Joint Committee comprising representatives of CPCB, HSPCB and Deputy Commissioner, Panipat to visit the site and furnish an Action Taken Report (ATR). The Hon'ble NGT also appointed HSPCB as the nodal agency.

In compliance to the direction of Hon'ble NGT, the Joint Committee visited PRPC & surrounding areas during 4<sup>th</sup> to 7<sup>th</sup> December, 2018 for carrying out inspection for air and water quality and consequently, submitted its interim report to the Hon'ble NGT on 15.1.2019. The Joint Committee's report inter-alia specified that the treated effluent quality from PRPC was not as per prescribed standards. The team also reported the odour and irritation in eyes. The ground water samples were also reported to be exceeding certain parameters prescribed by drinking water standards IS 10500 (2012).

Taking cognizance of the observations made by the Joint Committee report dated 15.1.2019, the Hon'ble NGT vide its order dated 01.03.2019 considered it necessary to require the Joint Committee to make a realistic assessment of the damage caused to public health and environment and immediate measures for stoppage of polluting activity. The joint committee was directed to submit its report on the same within one month. The joint committee was allowed to take any expert opinion or co-opt any other expert.

Keeping in view the time frame given by the Hon'ble NGT, the joint committee proceeded with the exercise without a third party expert member and inspected the unit again on 27.3.2019. The joint committee observed that IOCL has made some progress but yet to make complete compliance of all the observations made earlier by the joint committee. The joint committee was also of the opinion that outside experts in the area of Environment and Ground Water are required to conclude the assignment. As the assignment including engagement of experts was expected to take time, the joint committee decided to send its interim report (based on visit dated 27.3.2019) to Hon'ble NGT. Accordingly, the joint committee submitted its report to Hon'ble NGT on 22.4.2019.

Subsequently, the Joint Committee co-opted experts from Central Ground Water Board (CGWB) and National Environmental Engineering Research Institute (NEERI) for assessment of damage caused to ground water, public health & environment. The meeting of Joint Committee along with co-opted expert members was held on 26.4.2019. The co-opted expert members sought certain details and time for completing the study. It was decided by the committee to assess the environmental damage and propose preliminary compensation and cost of restoration based on the existing details and

submit the report to Hon'ble NGT before next date of hearing. The committee submitted its report to Hon'ble NGT on 9.5.2019. The report included tentative cost of restoration, further stating that the updated cost of restoration would be submitted after concluding the assessment of environmental damage to public health and ground water.

The assessment of the damage was divided into three components by the committee and the same was assigned to CPCB member, CGWB member and NEERI member as per details given below:

- A). Assessment of damage and cost of restoration w.r.to oxygen depletion and pollution caused to the surface water due to illegal discharge of effluent (CPCB Member)
- B). Assessment of damage caused to ground water and cost of restoration (CGWB Member)
- C). Assessment of damage caused to public health & environment (NEERI Member)

It is reported that the interim report was submitted by the CPCB member on 9/5/2019 and final report was submitted on 9/8/2019. Interim report was submitted by the CGWB member on 8/8/2019 and modified report was submitted on 5/9/2019. The report was submitted by the NEERI member on 2/8/2019. These reports were submitted to the Joint Committee for finalization before submission to the Hon'ble NGT.

Simultaneously, M/s IOCL also engaged The Energy and Research Institute (TERI) to assess the status of air, water and soil quality in order to quantify the environmental damage, due to operational activities of IOCL-PRPC. TERI submitted its report in June, 2019.

DC, Panipat vide its Letter No. 5183/MB dated 27.09.2019 sought EIL's expertise to evaluate the CGWB & NEERI reports proposed to be submitted to Hon'ble NGT shortly. The reports were to be evaluated in terms of contextual veracity and also with reference to impact assessment on public health, environment and remedial measures. A meeting was held with ADC, Panipat on 30.09.2019 wherein EIL desired that all relevant reports in this regard may be shared for study. Accordingly, the following reports were furnished to EIL by ADC, Panipat office:

- Joint Committee Report dated 15<sup>th</sup> January, 2019 submitted to Hon'ble NGT (copy attached as Appendix-I)
- Joint Committee Report dated 22<sup>nd</sup> April, 2019 submitted to Hon'ble NGT (copy attached as Appendix-II)
- Joint Committee Report dated 9<sup>th</sup> May, 2019 submitted to Hon'ble NGT (copy attached as Appendix-III)
- Reports (2 Nos.) of Central Ground Water Board (CGWB) (copies attached as Appendix-IV)
- Report of National Environmental Engineering Research Institute (NEERI) (copy attached as Appendix-V)
- Report of TERI prepared for IOCL-PRPC (report available with ADC's office)

EIL have studied all the reports (including reports of Joint Committee, CGWB, NEERI and TERI) to review the matter in totality. EIL's observations are presented in this report.

We understand that CPCB's interim report dated 9.5.2019 is the same report which is Joint Committee's report dated 9.5.19 above, and no separate report was submitted by CPCB. Also, we did not get copy of final report as reported to be submitted by CPCB on 9/8/2019. As such, our observations are based on Joint Committee/CPCB's report dated 9.5.2019.

Based on review of above mentioned reports, it is observed that the Joint Committee (including reports of CGWB & NEERI) have broadly identified following key problem areas which have caused pollution to the environment:

1. IOCL PRPC does not have permission to discharge treated effluent (from PX-PTA) in the Thirana Drain
2. The treated effluent (from PX-PTA) being discharged to Thirana Drain does not meet the prescribed discharge standards
3. The treated effluent (from PX-PTA) being discharged to Thirana Drain and Cess Pool water have polluted the surface and ground water
4. VOC emissions from PRPC is polluting the ambient air quality in the surrounding villages
5. Stagnant effluent (cess pool) due to accidental leakage of untreated effluent have polluted the ground water

EIL have reviewed all the above referred reports and their content in details. EIL have following observations on each of the identified key problem area:

**1. IOCL PRPC does not have permission to discharge treated effluent (from PTA) in Thirana Drain**

In Joint Committee's report dated 15.1.2019, it is stated that the complex does not have permission to discharge its treated effluent to Thirana Drain. Whereas it is also mentioned in the same report that the representatives of IOCL-PRPC have claimed that they have permission to discharge treated effluent to Thirana Drain. In order to get clarity on the issue, EIL requested ADC, Panipat office to furnish a copy of various EC/NOC/CTO granted to IOCL-PRPC by MoEF&CC/HSPCB till date. Copy of the same was furnished to EIL by ADC, Panipat office vide its email dated 15.10.2019. Based on review of these documents, the following were observed:

- Original Environmental clearance (EC) for Integrated Paraxylene and Purified Terephthalic Acid (PX-PTA) was granted by MoEF & CC vide its letter No. J-11011/52/2000/IA II dated 30.4.2001. As per the EC granted, IOCL was required to undertake maximum recycle/reuse of the treated effluent for process purposes in addition to green belt development.

Additionally, IOCL was allowed to discharge maximum of 255 m<sup>3</sup>/h of treated effluent from petrochemical complex to Thirana Drain.

- Subsequently, Environmental Clearance (EC) dated 26th March 2018 granted by MoEF&CC to IOCL for its BS-VI fuel quality up-gradation & expansion of PX/PTA plant (point no 11 (iii)) stated that in case of PX/PTA expansion project, there shall not be any increase in effluent discharge and the treated effluent of 255 m<sup>3</sup>/h shall continue to be discharged to the existing Thirana drain.
- Latest Consent to Operate (CTO) dated 25/7/2019 granted by HSPCB to IOCL (specific condition point no 5) stated that the unit will not discharge any effluent inside or outside the premises except 255 m<sup>3</sup>/h effluent of the treated effluent from PX-PTA plant into Thirana drain.

Further, specific condition point No. 6 stated that the unit will conduct the feasibility study of Zero Liquid Discharge (ZLD) from PX-PTA plant within the period of 18 months as per undertaking of the unit and will submit the technical feasibility report accordingly to achieve the ZLD from PX-PTA section.

As per the Joint Committee's report dated 15.1.2019, we understand that the committee took a stand that IOCL does not have permission to discharge treated effluent (from PTA) to Thirana Drain based on compliance statement given by IOCL, which states that the unit is reusing the treated effluent from PTA-ETP (ETP-III) as make-up to cooling towers and balance for irrigation in green belt. However, we could not find any amendment to EC/CTO or any other document to establish that the permission to discharge 255 m<sup>3</sup>/h of treated effluent to Thirana Drain granted as per original EC letter no. J-11011/52/2000/IA II dated 30.4.2001 have been withdrawn or suspended by MoEF&CC/CPCB/HSPCB.

Even the HSPCB's CTO as latest as 25/7/2019 allows discharge of 255 m<sup>3</sup>/h of treated effluent from PX-PTA plant into Thirana drain.

Hence, as per EIL's understanding, IOCL Panipat do have permission to discharge 255 m<sup>3</sup>/h of treated effluent to Thirana Drain.

## **2. The treated effluent (from PTA) being discharged to Thirana Drain does not meet the prescribed discharge standards**

Effluent samples were collected by the Joint Committee & its team from the outlet of ETP-I, ETP-II, ETP-III & ETP-IV. The effluent samples were also collected from the green belt around the unit and from the Thirana Drain. The effluent samples were collected during 4<sup>th</sup> to 6<sup>th</sup> December, 2018. The committee got all the collected samples analysed in HSPCB laboratory located in Panchkula during 5<sup>th</sup> to 9<sup>th</sup> December, 2018.

- In their report dated 12.01.2019, the joint committee reported that results of the ETP-I, ETP-II and ETP-III treated effluent were found exceeding the prescribed limits for parameters viz TSS, BOD, COD, Oil & Grease, and TDS. Results of ETP-IV treated effluent were found to be within prescribed limits. Results of surface water being discharged in Green Belt area were found exceeding in parameters TSS, BOD, COD, Oil & Grease, and TDS. The unit was found to be non-complying by the joint committee w.r.to parameters prescribed for treated effluent discharge.
- It is observed that analysis of one sample of effluent was under taken & analysed by HSPCB, which became the basis for all further conclusions by the Joint Committee and the expert agencies (including CGWB & NEERI). It is not clear from the report whether a grab sample (average of three samples) or composite sample (24 hourly) were collected by the team. No data of flow measurement was available in the report. Committee has considered 255 m<sup>3</sup>/h discharge limit as flow to the Thirana drain.  
EPA gazette notification 18<sup>th</sup> March 2008 states... quote“ Quantum of pollutant shall be calculated on the basis of daily average of concentration values (one 24 hourly composite sample or average of three grab samples as the case may be)average flow of the effluent during the day and crude throughput capacity of the refinery.” Unquote.
- It is reported by the joint committee that PRPC also have OCEMS (Online Continuous Emission Monitoring System) installed for real time monitoring of treated effluent and the same was found to be accurate and calibrated as per their report dated on 22.04/2019. The real time data is also online transmitted to central server of CPCB/HSPCB. However, no historical records of the OCEMS data were found in the report. Further, the records of OCEMS data were not taken into cognizance by the Joint Committee.
- In case there were variations in the OCEMS data and the lab analysis results, it would have been prudent to take multiple samples at each locations and get them analysed at different labs to eliminate the chances of error (human and/or monitoring/ analysis equipment) in effluent sampling and lab analysis. This has become even more imperative as further assessment of damage to environment as drawn by CPCB and other expert agencies (CGWB & NEERI) including cost of environmental restoration is based on the results of this single lab analysis carried out by HSPCB.

EIL is of the view that in order to have reached at logical conclusion in terms of non compliance by IOCL, the committee should have compared the OCEMS data and the data of treated effluent samples as per gazette notification requirement. Also, past data which might have been taken by HSPCB/CPCB/MOEF&CC as a part of routine environmental compliance monitoring should also be complimented.

**3. The treated effluent (from PTA) being discharged to Thirana Drain & Cess Pool water have polluted the surface and ground water**

It has been reported that 'Discharge of effluent in Thirana Drain' and 'Discharge of untreated effluent in Cess Pool' have contaminated the surface water and ground water, for which damage to the environment and cost of environmental restoration have been assessed by the Joint Committee. Additionally, outside experts from CGWB and NEERI were co-opted by the joint committee to estimate damage to ground water and public health. The assessment of the damage was divided into three components and the same was assigned to CPCB member, CGWB member and NEERI member as per details given below:

- A). Assessment of damage and cost of restoration w.r.to oxygen depletion and pollution caused to the surface water due to illegal discharge of effluent (CPCB Member)
- B). Assessment of damage caused to ground water and cost of restoration (CGWB Member)
- C). Assessment of damage caused to public health & environment (NEERI Member)

*A). Assessment of damage and cost of restoration w.r.to oxygen depletion and pollution caused to the surface water due to illegal discharge of effluent (CPCB Member)*

It was considered in the report that the effluent discharged to Thirana Drain and Cess Pool having BOD results in the depletion of oxygen equivalent to the amount required for stabilization of BOD. Oxygen demand was calculated @ 2.67 g O<sub>2</sub>/g of Carbon based on formula (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6O<sub>2</sub> = 6CO<sub>2</sub> + 6 H<sub>2</sub>O). Further, the cost of oxygen @ Rs. 25/kg was considered for estimating environmental damage in monetary terms.

- The committee has estimated that the unit was not complying with the treated effluent discharge standards for a total period of 120 days (i.e. from 4/12/2018 to 2/4/2019). Accordingly, joint committee has estimated that total 7,34,400 m<sup>3</sup> (= 255 m<sup>3</sup>/h x 24 hours x 120 days) of off-specifications treated effluent was discharged in the Thirana Drain. This effluent (having 170 mg/L BOD as measured by HSPCB) is calculated to be contributing to 124848 kg of BOD, which is estimated to be equivalent to 333344.16 kg of oxygen.
- Cess pool area was measured to be 250 m x 8 m. Accordingly, it was estimated that total 5,000 m<sup>3</sup> (250 m x 8 m x 2.5 m stagnant effluent depth in cess pool area) of untreated effluent was discharged in Cess Pool. This effluent is calculated to be contributing to 7500 kg of BOD (1500 mg/L BOD considered in calculations), which is estimated to be equivalent to 19500 kg of oxygen.

With reference to the above estimation by the joint committee, the following points may please be relooked into to finally arrive at damage to environment:

- In the lab analysis carried out by HSPCB, the BOD has been reported as 170 mg/l in ETP-III effluent discharged to Thirana Drain. As 30 mg/l is permissible limit for ETP-III effluent discharge, the difference in BOD (i.e. 140 mg/l) needs to be considered for estimating environmental damage in monetary terms.
- In the lab analysis carried out by HSPCB, the BOD has been reported as 900 mg/l in effluent discharged to Cess Pool. However, 1500 mg/l BOD has been considered by the committee in calculating environmental damage.
- Analogy to calculate oxygen requirement is based on consideration that 192 gram of oxygen used to oxidize 72 gram of carbon. The oxygen required for each carbon atom is considered in calculations, whereas the oxygen available with the molecule ( $C_6H_{12}O_6$ ) was not considered. So to consider that effluent will exchange all the oxygen from atmosphere is not correct. The cost of treatment of such effluent should have been considered @ 1.066 g O<sub>2</sub>/g of BOD (= 192 g O<sub>2</sub>/ 180 g  $C_6H_{12}O_6$ ) instead of @ 2.67 g O<sub>2</sub>/g of carbon as considered by the committee.
- As Px PTA effluent passes through forced aeration where atmospheric oxygen is forced transferred into effluent. There is always dissolved oxygen available upto 2 mg/l in the aerated water. This quantity of oxygen from the air will be in equilibrium as per partial pressure with the atmosphere. This aspect shall be taken into consideration.
- The damage calculation is based on analysis of single sample as stated under SN 2. This aspect is also required to be looked into.

*B). Assessment of damage caused to ground water and cost of restoration (CGWB Member)*

It is reported that the interim report was submitted by the CGWB member on 8/8/2019 and modified report was submitted on 5/9/2019. Two reports have been received from ADC, Panipat office (attached as Appendix IV). It is considered that these are the same reports as submitted by the CGWB member (as there is no date on the subject reports). CGWB collected 31 ground water samples covering an area of about 500 Sq. km around PRPC to assess the ground water contamination. Additionally, the data collected by the HSPCB during the preliminary study was also used for the study. Parameters such as Electrical Conductivity, Chemical Oxygen demand (COD), Total Organic Carbon (TOC), Iron, Fluoride and heavy metals in ground water samples were used as indicators to demarcate the contaminated ground water area.

- CGWB expert estimated that ground water in about 75 Sq. km area around the refinery is contaminated by one or more than one parameters as discussed above. Considering contaminated aquifer thickness of 30 m and specific yield of 12%, total 270 Million Cubic Meters of water is estimated to be contaminated which is not fit for drinking water purposes.

- Dewatering and refilling of contaminated aquifers is proposed in the report. Surface water from the Western Yamuna Canal is proposed to be recharged in the aquifer. The contaminated ground water withdrawn is proposed to be used for irrigational requirements in the surrounding areas and partly for industrial requirements in Panipat Refinery.
- The water conservation fee @ Rs. 20/- per cubic meter has been considered in the report. Accordingly, environmental compensation for dewatering 270 MCM of water is estimated to be Rs. 540 Crores.

With reference to the above estimation, the following points may please be relooked into:

- CGWB has relied on single sampling of effluent carried out by HSPCB during initial assessment. No fresh sampling of effluent was carried out by CGWB for independent assessment of effluent quality. Also, CGWB did not carry out a fresh analysis of COD in the ground water samples collected by them. CGWB has relied on COD analysis of ground water samples as carried out by HSPCB.
- Environmental damage estimated by CGWB is based on the presumption that since off-specifications effluent is being discharged and ground water is found to be contaminated, the entire ground water pollution has been caused by this effluent only. No quantitative assessment has been made to confirm the pollutant source(s) and extent of pollution caused by these sources(s).
- Majority of effluent discharged to Thirana Drain is expected to join the surface water body and not the ground water aquifer. An assessment needs to be made to quantify the effluent which would have joined surface water streams and ground water resources respectively to estimate environmental damage to respective source in quantitative terms.
- Feasibility and quantum of ground water contamination by other industrial and agriculture activities predominant in Panipat District is required to be carried out to exactly find out the cause of pollution.
- Present levels of contaminants in ground water have not been compared with prevailing ground water quality before PRPC starts its commercial operations to establish the baseline ground water quality and to assess the incremental increase in ground water pollutants. A study carried out by TERI for IOCL (based on fresh ground water sampling and comparing results with NEERI EIA report carried out in 1993) in this regard has indicated no deterioration in ground water quality from the year 1993 to present condition.
- There may be seasonal variation in ground water quality, due to which EC (TDS), COD and Iron component may change. The variation in TDS happens over a period of time due to extraction of ground water for irrigation.

- COD content in shallow ground water may also be attributed to usages of pesticide and fertilizers and even organic manure and the same case will be for TOC. High Iron content in water may be due to soil quality, and soil samples are needed to be checked for iron content. Also iron content may appear in local area if hand pumps and tube wells are old and not frequently operated. There is a need to establish the reasons for high iron content, TOC, COD and EC in some samples. For comparing, available old data for the same/nearby sampling locations shall be used where present sampling is being done. The committee may go for fresh consolidated time average samples again at those points which are showing higher values and their analysis at three different labs of national repute to dispel any ambiguity.
- As per CGWB Report, the contaminated ground water is proposed to be dewatered and proposed to be partly used for irrigational requirements in the surrounding areas and partly for industrial requirement of PRPC. Joint Committee may please ensure suitability of this water for irrigation as the water is reported to be contaminated. Also, the surface water from Western Yamuna Canal is proposed to be recharged in the ground water aquifers. Joint Committee may please ensure that the quality of Western Yamuna Canal is better than the existing ground water quality and it is fit for ground water recharge.
- Engineering feasibility of simultaneous withdrawal and refilling of aquifers needs to be assessed for its implementation as same water will percolate back to reservoir, if used for irrigation again.
- Large variation in ground water quality were observed in CGWB report, although some of the sampling locations appears to be very close. For example, Iron in Sample No. 11 (Mahinder singh S/O Shri Sadhuram, CISF colony, Baholi) and Sample No. 12 (Mahinder singh S/O Shri Sadhuram, CISF colony, Baholi) are reported to be 1.877 mg/L and 0.043 mg/L respectively. Similarly, Iron in Sample No. 15 (Pawan s/o Pale ram, near railway line, Baholi) and Sample No. 16 (Munsiram, sohanlal dera, Inside Raily line, Baholi) are reported to be 4.985 mg/L and 0.031 mg/L respectively. Reasons for such large variations in ground water quality for nearby sampling locations have not been covered in the report.
- TOC have not been measured at all 31 sampling locations selected by CGWB (TOC have been measured only at 15 locations out of total 31 locations). In general, it is observed that TOC has not been measured at locations which are far away from refinery. It is proposed to carry out analysis of TOC in all ground water sampling locations to study the prevailing levels of TOC in the entire study area (including uncontaminated ground water).
- Large variations were observed in the ratio of TOC (measured by CGWB) to COD (measured by HSPCB) at different sampling locations. This ratio (TOC/COD) varies from as high as 5.23 for Sample No. 14 (Ravi kumar ranga, KBPL gate, Phool singh dera) to as low as 0.08 for sample No. 15 (Pawan s/o Pale ram, near railway line, Baholi). This ratio is 3.68 for Sample No. 17 (Vill-Singhpura, Satpal sarpanch dera, Babadargha), although this

sampling location is very close to Sample No. 15. Reasons for such large variations in TOC/COD ratio in ground water quality have not been covered in the report, although both TOC & COD represents similar type of contamination. Normally in refinery waste water the ratio of COD: TOC does not vary much. It is proposed that same agency (CGWB) shall carry out sampling and analysis of both the parameters (TOC & COD) in all 31 sampling locations.

- Joint Committee's view that ground water is fit for Industrial use and irrigation purpose as cited in their report and solution provided to replenish ground water with Western Yamuna Canal water seems to be unsustainable as it may further deteriorate the ground water quality (especially w.r.to micro-bacterial contamination) and soil quality. It might also result in emission, noise and increase in carbon foot print due to continuous operation of pumps. Moreover, water quality/quantity might not be matching with industrial/irrigation water requirements.

For a sustainable solution, extensive rain water harvesting (annual rain fall more than 600mm) in contaminated ground water zone should be explored to bring back the quality to the normal as deem fit for drinking water with timely monitoring. Meanwhile, IOCL may be asked to provide safe drinking water to affected population.

An effort has been made by EIL for more scientific assessment of ground water pollution by assuming that entire effluent discharged to Cess Pool has percolated down and polluted the ground water, whereas only 20% of the effluent discharged to Thirana Drain has percolated down and polluted the ground water. Accordingly, mathematical impact of water/effluent ingresses to the ground water has been carried out, which is attached in ANNEXURE-I. The following is the summary of the assessment:

	<b>COD (mg/L)</b>	<b>TDS (mg/L)</b>	<b>Iron (mg/L)</b>
Concentration in 31 Ground Water Samples (as per analysis carried out by HSPCB)	7.2 - 76.8	370 - 1420	0.009 - 25.167
Impact on Ground Water due to estimated discharge by PRPC	0.352	1.266	0.00027

Above assessment suggests that impact on ground water quality due to 'Discharge of effluent in Thirana Drain' and 'Discharge of untreated effluent in Cess Pool' is negligible in nature and couldn't have impacted ground water quality to the extent as believed by the joint committee.

In view of above observations, it is strongly recommended that a '**Source Apportionment Study**' should be carried out to establish the following:

- Establishing benchmark baseline environmental data (air, surface water, ground water, etc.) before PRPC starts its commercial operations (based on available historical data)
- Evaluation of changes in the baseline environmental data over a period of time (based on available historical data)
- Assessment of total damage to the environment components with reference to benchmark baseline environmental data
- Quantitative assessment of proportion of environmental damage caused by IOCL-PRPC and other industrial and agriculture activities predominant in Panipat District

C). Assessment of damage caused to public health & environment (NEERI Member)

The report was submitted by the NEERI member on 2/8/2019. The report has assessed the following damage costs:

- Environmental damage cost due to excess discharge in Thirana Drain (separate damage cost has been estimated for individual parameters of BOD, COD & TSS)
- Environmental damage cost due to direct discharge of effluent into Cess Pool
- Health damage cost due to air pollutants

The report is based on a single analysis carried out by HPCB and Environment damage calculation is based on theoretical analysis rather than on factual basis. The following points may please be relooked into to carry out a more conclusive damage cost assessment:

- Similar to CGWB report, NEERI has also relied on single sampling of effluent carried out by HSPCB during initial assessment. No fresh sampling of effluent was carried out by NEERI for independent assessment of effluent quality.
- Actual quantitative assessment of damage to surface and ground water resources has not been carried out in the report. It is presumed that the environmental damage to surface & ground water resources has happened since the effluent was reported to be non-complying to the prescribed discharge standards.
- CPCB discharge standards have been considered as applicable for refinery effluent and not for petrochemical effluent.
- **Damage due to discharge in Thirana Drain:** We are not sure how the non-compliance periods of 506 days have been arrived, whereas joint committee earlier had considered non-compliance period of 120 days. The non-compliance period is also based on one day reading of BOD, COD & TSS. Further, if damage cost due to COD has been considered, the damage cost assessed due to BOD is repetitive. Moreover, the damage to surface water has also been assessed by CPCB in its report.

- **Damage due to discharge in Cess Pool:** The cess pool effluent was required to be treated back in IOCL's waste water treatment plants as it was created due to accidental damage to the pipe line. Dilution of this effluent is not a solution as fresh water should never be used to be mixed up with effluent to meet the norms. Also, the discharge year considered as 2017 needs to be corrected. Moreover, the damage to ground water has also been assessed by CPCB in its report.
- **Health damage:** With regards to health damage cost due to air pollutions, the NEERI expert himself expressed uncertainty with regard to source of pollutants. However, for the purpose of damage cost assessment, all the reported air borne diseases have been assumed to be due to pollutants emitted from PRPC stacks. The report did not take cognizance of spot sampling carried out by the Joint Committee, wherein air emissions from PRPC stacks were found to be within permissible limits. Also, no cognizance has been taken of the data of continuous stack monitoring system of PRPC. Further, no air dispersion modelling was carried out to establish the ground level concentrations of pollutants.  
Health assessment of PRPC employees is also to be taken into account as they remain in the first line of exposure to the air pollution.

In view of above observations, EIL is of the view to carry out a detailed scientific study including air dispersion modelling to find the root cause of the health related problems. NEERI expert in its report has also suggested that ambient air quality monitoring over the refinery area needs to be carried out to avoid the ambiguity.

#### **4. VOC emissions from PRPC is polluting the ambient air quality in the surrounding villages**

The joint team collected spot samples from 4 stacks in Refinery and 2 stacks from Naphtha Cracker in PRPC between 4<sup>th</sup> to 7<sup>th</sup> December, 2018 and Ambient Air Quality of villages Sithana, Baholi and near the unit. The team also visited the open ponds within PRPC meant for storing treated & untreated effluents. Following observations were made by the joint team:

- Irritation to eyes and odour were observed at various locations inside PRPC premises and outside adjacent to PRPC premises
- Results of spot sampling of refinery and petrochemical stack emissions were carried out and found to be within permissible limits with respect to SO<sub>x</sub>, NO<sub>x</sub> and PM. PM values in AVU1 and AVU2 stacks were measured as 53.5 mg/m<sup>3</sup> and 4.8 mg/m<sup>3</sup> respectively against prescribed limit of 96 mg/m<sup>3</sup>. Similarly, PM values for HGU-76, HGU-77, NCU Heater-500 and NCU Heater-300 stacks were measured as 3.7 mg/m<sup>3</sup>, 3.5 mg/m<sup>3</sup>, 1.3 mg/m<sup>3</sup> and 3.8 mg/m<sup>3</sup> respectively against the prescribed limit of 10 mg/m<sup>3</sup>.
- Ambient Air Quality (for SO<sub>2</sub> and NO<sub>x</sub> parameters) of nearby areas was found to be within permissible limits of National Ambient Air Quality Standards (NAAQS).

- Ambient Air Quality (for PM10 parameter) of nearby areas recorded in the range of 123.5 to 290 micro-g/m<sup>3</sup> were found to be higher than the permissible limits of 100 micro-g/m<sup>3</sup> as per NAAQS.

Although, PM10 parameter in ambient air of nearby areas was found to be higher than the permissible limits, the same cannot be attributed to PRPC operation as refinery/petrochemical complexes are not a major source of particulate matter (PM) pollution. This is also substantiated by the fact that particulate matters were found to be within permissible limits in refinery/petrochemical stacks emission. Higher emissions of PM10 is predominant problem in most of this region and is primarily dominated by local phenomenon of transportation, automobiles emissions, agriculture and other localized activities in the region.

Irritation to eyes and odour were assessed by the team based on human observations. We understand that no measurement was carried out by the team to assess the levels of VOCs in the ambient air quality, which could probably cause eyes irritation and odour. The ambient air quality monitored by TERI for IOCL have indicated that Benzo(a) Pyrene and Benzene in ambient air in surrounding villages are within permissible standards as per NAAQS laid down by CPCB.

A more detailed scientific study might be required to ascertain the exact reasons for eyes irritation and odour. However, the possibility of VOC's emissions from open effluent storage ponds in the PRPC cannot be ruled out. As such, IOCL may be advised to propose an action plan for covering of open ponds and control of VOC emissions from these ponds.

5. **Stagnant effluent (cess pool) due to accidental leakage of untreated effluent have polluted the ground water**

It has been reported that accidental leakage of untreated effluent line has resulted in stagnant effluent (cess pool). Joint team in subsequent visit have reported that the unit has restored the area where earlier stagnant effluent was found discharged in green belt. Although the area has been restored by IOCL, but the damage to surrounding soil and green belt vegetation cannot be ruled out. This localized damage to soil and green belt cover may be assessed and action plan to be made to restore these components to original conditions. Any significant ground water pollution due to this accidental leakage of untreated effluent is not expected for reasons as explained earlier in this report.

**ANNEXURE-I****Assessment of Ground Water Pollution caused by Effluent Discharged from IOCL-PRPC**

<b>Assessment of Impact on Ground Water COD</b>			
Total quantity of off-specifications treated effluent discharged to Thirana Drain as estimated by the Joint Committee	(A)	7,34,400	m3
Total quantity of Thirana Drain Effluent percolated down and polluting the ground water, assumed @ 20% of (A)	(B)	1,46,880	m3
COD of effluent discharged to Thirana Drain (as per HSPCB lab analysis)	(C)	460.8	mg/L
Total COD (in kg) discharged to ground water through Thirana Drain (= B x C /1000)	(D)	67,682	kg
Total quantity of effluent discharged to Cess Pool as estimated by the Joint Committee	(E)	5,000	m3
COD of effluent discharged to Cess Pool (as per HSPCB lab analysis)	(F)	5,472	mg/L
Total COD (in kg) discharged to ground water through Cess Pool (= E x F /1000)	(G)	27,360	kg
Total 'COD' estimated to be Discharged to Ground Water (= D + G)	(H)	95,042	Kg
Quantity of ground water estimated to be contaminated (as per CGWB member report)	(I)	27,00,00,000	m3
<b>Impact on Ground Water 'COD' due to estimated discharge by PRPC (= H X 1000 / I)</b>		<b>0.352</b>	<b>mg/L</b>

<b>Assessment of Impact on Ground Water TDS</b>			
Total quantity of off-specifications treated effluent discharged to Thirana Drain as estimated by the Joint Committee	(A)	7,34,400	m3
Total quantity of Thirana Drain Effluent percolated down and polluting the ground water, assumed @ 20% of (A)	(B)	1,46,880	m3
TDS of effluent discharged to Thirana Drain (as per HSPCB lab analysis)	(C)	2,224	mg/L
Total TDS (in kg) discharged to ground water through Thirana Drain (= B x C /1000)	(D)	3,26,661	kg
Total quantity of effluent discharged to Cess Pool as estimated by the Joint Committee	(E)	5,000	m3
TDS of effluent discharged to Cess Pool (as per HSPCB lab analysis)	(F)	3,050	mg/L
Total TDS (in kg) discharged to ground water through Cess Pool (= E x F /1000)	(G)	15,250	kg
Total 'TDS estimated to be Discharged to Ground Water (= D + G)	(H)	3,41,911	Kg
Quantity of ground water estimated to be contaminated (as per CGWB member report)	(I)	27,00,00,000	m3
<b>Impact on Ground Water 'TDS' due to estimated discharge by PRPC (= H X 1000 / I)</b>		<b>1.266</b>	<b>mg/L</b>

<b>Assessment of Impact on Ground Water IRON</b>			
Total quantity of off-specifications treated effluent discharged to Thirana Drain as estimated by the Joint Committee	(A)	7,34,400	m3
Total quantity of Thirana Drain Effluent percolated down and polluting the ground water, assumed @ 20% of (A)	(B)	1,46,880	m3
IRON of effluent discharged to Thirana Drain (as per HSPCB lab analysis)	(C)	0.406	mg/L
Total IRON (in kg) discharged to ground water through Thirana Drain (= B x C /1000)	(D)	59.6	kg
Total quantity of effluent discharged to Cess Pool as estimated by the Joint Committee	(E)	5,000	m3
IRON of effluent discharged to Cess Pool (as per HSPCB lab analysis)	(F)	2.806	mg/L
Total IRON (in kg) discharged to ground water through Cess Pool (= E x F /1000)	(G)	14.03	kg
Total 'IRON estimated to be Discharged to Ground Water (= D + G)	(H)	73.63	Kg
Quantity of ground water estimated to be contaminated (as per CGWB member report)	(I)	27,00,00,000	m3
<b>Impact on Ground Water 'IRON' due to estimated discharge by PRPC (= H X 1000 / I)</b>		<b>0.00027</b>	<b>mg/L</b>

**NOTE: Similar assessment may be drawn for stagnant water in plantation area**

Observations and Recommendations of HSPCB Member of Joint Committee

- The undersigned does not agree with the observations of District Administration with regard to the claims on the permission/consent/clearance relating to discharge of effluent into Thirana drain by the unit, as indicated by M/s EIL (engaged by District Administration) in their report. The undersigned is of the view that the decision in this regard has already been taken by competent authority of the Board. After going through the record it was observed that unit in question has been granted CTO vide No. HSPCB/Consent/: 313105617PITCTO3530800 Dated:13/06/2017 for the period 01/04/2017 - 30/09/2021 with the mode of discharge as "Reuse & Recycle" and the unit has obtained revised CTO vide No. HSPCB/Consent/: 313105619PITCTO6796558 Dated:25/07/2019 for the period 23/07/2019 - 30/09/2021 but the CTO was granted with the condition "That the unit will not discharge any effluent inside or outside the premises except 255 m<sup>3</sup>/hr effluent of the treated effluent from PX-PTA plant into Thirana drain and will comply with the standards prescribed as per Environment (Protection) Rules, 1986 for Petrochemical (Basic & Intermediates) units." Which came in force w.e.f 23.07.2019, From which it is evident that before 23.07.2019 unit did not have any CTO for discharge of the treated effluent in to Thirana Drain .
- Grab Samples were collected by HSPCB Team after following due procedure prescribed under section 21 of the Water Act 1974 as per Law and under the direct supervision of Joint Committee constituted in this matter as per orders of Hon'ble NGT, by issuing proper notice of intention to the representative of the Industry. The sample was collected and sealed in the presence of the representative of the Industry.
- Legal samples collected by the Joint team were analyzed by notified Board's Analysis. There is also a provision in the Act, which permits the Industry to request for one parallel sample drawn by the HSPCB Team sealed, for getting it tested from the referral Laboratory of the State



Environment Department through State Pollution Control Board. The industry could have done it at that point of time. They were asked by the Joint Committee while issuing notice of intention but Industry didn't opt for this. Similarly, villagers were also asked by the Joint Committee if they want to send the parallel hand pump samples to the referral Laboratory of the State Environment Department but they also didn't opt this option. Further, it is also pertinent to note that the inspection of M/s IOCL, Panipat refinery was conducted by the Joint Committee only and sampling was done as per procedure laid down by the Board and the report on the same has also been submitted by the Joint Committee itself to NGT also.

- It has also been observed by the undersigned that the unit has also failed to manage the treated and untreated effluent properly, which have presently been stored in earthen lagoons covering a large area without any arrangement to capture VOC.
- However, all the suggestions given by Deputy Commissioner, Panipat for improving the general environmental conditions of the area, have been agreed by the undersigned.
- After going through the assessment reports of CPCB, CSIR-NEERI, CGWB, and District Administration the undersigned opines that the justification for doubling of the environmental compensation assessed by CPCB has not been clearly brought out in the report. Further, the violation period accounted by CSIR-NEERI and CPCB are different and there is no uniformity in the period for which the violations have been counted for. Also, a component of the environmental compensation relating discharge of effluent indicated by CPCB Member has also been included by CSIR-NEERI in his report, thereby duplicating the same. Therefore this aspect may require re examination by the Joint Committee further.

  
(Rajesh Garhia)  
28.11.19  
Member Joint Committee,  
Sr. Scientist HSPCB