Annexure 10: Application of CGWA and Details of Rain Water Harvesting.

Application is submitted in following format:
INTRODUCTION

Introduction about Company

The unit is located in Plot No. 17,18/1, 18/2 & 20, Village Katol, Taluka Kalol, District Panchmahals of Gujarat State.

Production of ABS sheets was started in this premise by name of Company ABS Plastics Ltd in 1987. Production of SAN (Styrene Acrylonitrile) was started with technology from JSR (Japan Synthetic Rubber) in 1993. In same year, name of the company changed from ABS Plastics ltd to ABS Industries Ltd. In 1997 Bayer AG (Germany) procured 51 % shares and company became a Bayer group company then name of the company became Bayer ABS Ltd. In 2004 spin off of Bayer AG into two groups. Company became part of Lanxess group and became Lanxess ABS Ltd. In 2008, Lanxess sold the global ABS business to INEOS and Company is now part of INEOS Group. At present the name of Company is INEOS ABS (India) Ltd.

The unit has valid CC& A to product Styrene Acrylonitrile Resin 72000 MTA and ABS Sheet 2400 MTA.

Purpose of this Report

INEOS ABS (India) Ltd. is withdrawing groundwater for their industrial unit. The unit is now proposing to do expansion. For that they have applied to Ministry of Environment and Forests for the Environmental Clearance. A presentation to discuss the proposed Terms of Reference (ToR) with the Expert Appraisal Committee (Industry) was held on 29th April 2010. Subsequently, the Expert Appraisal Committee of the MoEF issued a formal Terms of Reference for the project vide letter dated 10th June 2010. This ToR letter is attached as Annexure 1. As per Point No. 24 ‘Permission’ for the drawl of ground water from the CGWA/SGWB is required.

So, application to CGWA is required to withdraw groundwater as the unit is located in semi-critical area notified by CGWA.

Production Capacity

Table 0-1: Production Capacity

<table>
<thead>
<tr>
<th>Product</th>
<th>Production in MTPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
</tr>
<tr>
<td>SAN</td>
<td>72,000</td>
</tr>
<tr>
<td>ABS Sheet</td>
<td>2,400</td>
</tr>
</tbody>
</table>

Site Location Map

Site Location map of M/s. INEOS ABS is given below
Map 1.1: Site Location Map
Map 1.2: Site Location Map
Map 1.3: Site Layout Map
ENVIRONMENTAL SETTING

Physiography and Relief
Panchmahals District can be divided into three main parts:

- Undulating hilly area, East-North-East and part of North Piedmont zone
- Western and southern Plain

The east and northeast areas are covered with rolling hills with longitudinal steel slopes. Heights vary between 213 m to 487 m above mean sea level. Hills are intervened by valleys. The piedmont zone runs all along the periphery of the hilly zone. It comprises loose weathered material gently sloping towards the plain. The western plains are flat and are traversed by the rivers. Pavagadh Hills near Halol raising abruptly to a height of 829.36m above mean sea level form the highest land mark of the area. INEOS-ABS lies in 84m above mean sea level.

Geology of the study area
Geologically the rock types in the area appear to be distinct. Structurally the eastern parts are highly undulated and mainly constitute rocks of Champaner series of Archean age. On western side along with the exposure of rocks of rocks of chamapaner series, Deccan Trap, upper creataceous beds granite and gneiss are seen. Rest of the area is covered with the recent and sib recent alluvium. The stratigraphic sequence of the rocks found in the district is tabulated in Table 0-1.

Table 0-1: Stratigraphic sequence

<table>
<thead>
<tr>
<th>Period</th>
<th>Age</th>
<th>Lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td>Holocene</td>
<td>Blown sands recent clay-alluvium</td>
</tr>
<tr>
<td>Cretaceous to Eocene</td>
<td></td>
<td>Deccan Trap</td>
</tr>
<tr>
<td>Upper Cretaceous</td>
<td></td>
<td>Calcareous and ferruginous</td>
</tr>
<tr>
<td>Infracretaceous</td>
<td></td>
<td>Lime stone-Sand stone</td>
</tr>
<tr>
<td>Champaner series to</td>
<td></td>
<td>Granite and gneiss, lime stone, Quartzite, Mica schist, Phyllites, Conglomerate and ceritic granite schist, pegmatite venis, limestone, banded gneissic complex.</td>
</tr>
<tr>
<td>Aravally system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: District Resource Map)

Katol Village Pond
Katol village pond remains dry most of days of years as no runoff water goes in pond from surrounding area. Minimum Depth of pond is 3.1m (minimum is 3.1m and Maximum is 5.7m)
D 0-1: Diagram Showing Depth of Katol Village Pond and Surroundings
Reason for No Runoff Water flows in Katol Pond

Reason for no runoff water flows in Katol pond is stated below

1) Katol Village runoff water is going to Goma River instead of Pond as natural drainage pattern of village is towards Goma River and periphery of pond is higher than village so possibility of Village runoff water to pond is ruled out.

- Periphery of Katol Pond
- Road
- Katol Village

2) Due to lack of proper natural drain culvert, water from north side and west side of Katol pond can not flow in to Katol Pond.

3) Roadside natural drain culvert is totally filled by soil, grass so no runoff water either from roadside or from farm- side can come to that culvert and then finally go to pond.

4) Permission is already taken from village panchayat for developing run off network.
WATER BALANCE

Water balance for existing and proposed project is given in Table 0-1

Table 0-1: Water Balance Diagram

<table>
<thead>
<tr>
<th>Activity</th>
<th>Existing requirement (M³/Day)</th>
<th>Proposed requirement (M³/day)</th>
<th>Total Requirement (M³/day)</th>
<th>No of Operational day in a Year</th>
<th>Annual requirement (M³/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Activity</td>
<td>224</td>
<td>124</td>
<td>348</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Residential / domestic</td>
<td>40</td>
<td>15</td>
<td>55</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Green Belt development Environment maintenance</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>Other use</td>
<td>07</td>
<td>05</td>
<td>12</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Grand Total</td>
<td>271</td>
<td>144</td>
<td>415</td>
<td>365</td>
<td>1,51,475</td>
</tr>
</tbody>
</table>
D 0-1: Water Balance for Existing

**Note:** All units are in KLD
D 0-2: Water Balance Diagram after Proposed Expansion

Note: All units are in KLD
**REQUIREMENT FOR CGWA PERMISSION**

**Location of Unit as per CGWA**

M/s. INEOS ABS is located in semi-critical zone specified by CGWA.

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**D 0-1: Categorization of as per CGWA**
Table 0-1: Evaluation of Proposals to Abstract Ground Water for Industries

<table>
<thead>
<tr>
<th>Category</th>
<th>Stage of Development (%)</th>
<th>Recycle/Reuse</th>
<th>Other Water Conservation Practices</th>
<th>Withdrawal permitted (% Age of proposed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi- Critical</td>
<td>70-80</td>
<td>Efficient utilization of recycled water and reuse of water should be mandatory.</td>
<td>Water audit measures to be adopted</td>
<td>Withdrawal may be permitted subject to undertaking of recharge measures. Since the area is less stressed, at least 50% recharge be made mandatory.</td>
</tr>
</tbody>
</table>

(Source: CGWA Guideline)

**Required to Recharge Water**

As M/s. INEOS ABS is located in semi-critical zone specified by CGWA, the unit has to recharge at least 50% of water withdrawal.

After proposed expansion, water requirement will be 415 KLD (Annual 1,51,475 m³). So, INOES has to recharge 207 KLD (Annual 75,555 m³) of water.
RAIN WATER HARVESTING AT SITE

Rainwater harvesting is a mechanism involved in collecting, storing and putting rainwater to use when it is most needed. A rainwater harvesting system comprises of various stages - transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge.

Rain water harvesting can be done by three ways;
- Recharge through Roof Top
- Rain water storage Tank (20kl under ground tank)
- Recharge through surface run-off

There are five components in a rainwater harvesting system namely catchment, conveyance, filtration, storage and recharge.

Advantages of Rain Water Harvesting

There are various advantages of Rain Water Harvesting from which some of them are listed below:
- Outsourcing is reduced as it allows use of rainwater in case of scarcity.
- Solution to water problems.
- Effective rise in Ground Water levels.
- Inexpensive and simple technology.
- It’s economical & energy saving as it prevents extraction of water from depleting Ground Water Table.
- Provides high quality water, having low mineral content.
- Easy operation & maintenance.
- Reduces soil erosion.

Design of Rain Water Harvesting

Quantity of Rain water collected depends upon:
- Average Rainfall Intensity.
- Catchment area.
- Run-off coefficient.

Design Calculations

Area availability for Rain Water Harvesting:

Area Available Rain Water Harvesting is as under:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Land Area</td>
<td>37,645 m²</td>
</tr>
<tr>
<td>Roof Top area of building/sheds</td>
<td>9410 m²</td>
</tr>
</tbody>
</table>
Road/ paved area : 4042 m²
Green belt Area : 8577 m²
Open Land : 15616 m²

**Rainfall Intensity for the region:**
Average Rainfall per year= 922.7 mm, No historical rainfall available at site. Nearest rain fall data is collected from Baroda Air port and its 38km from the project site. (Source: Baroda, Climatological ,Table 1951-1980, IMD)

**Co-efficient and Factor Adopted:**
**Table 0-1: Runoff Co-efficient**

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Run off Co efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof top area of building/sheds</td>
<td>0.85</td>
</tr>
<tr>
<td>Road and Paved area</td>
<td>0.5</td>
</tr>
<tr>
<td>Green belt area</td>
<td>0.2</td>
</tr>
<tr>
<td>Open land</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(Source: Concepts & Practices for Rain Water Harvesting CPCB)

**Retention Time in Recharge Well**
(10 - 15) min per hour
**Volume of Harvesting Pit**

\[ Q \times \text{Retention Time} \]

Where,

\[ Q = \text{Catchment Area} \times \text{Harvesting Factor} \times \text{Rainfall intensity (mm/ hour)} \]

**Components for Rain Water Harvesting Scheme**

**Catchment**
The Catchment of a water harvesting system is the surface which directly receives rainfall. It can be a paved area like Terrace of a building or an unpaved area like lawn or open ground.

**Manhole**
Manholes are Brick Masonary Structure placed in between the Drainage line so that some percentage of water gets percolated directly through manhole. Percolation of rain water through manhole depends upon the permeability of the soil.

Each Manhole, in this case, contributes around 10% of percolation depending on soil permeability.

**Conduits/Pipeline**
Conduits are pipelines or drains that carry Rain Water from the Catchment area to Rain Harvesting System.

**Desilting Chamber**
The rainwater first enters the desilting chamber where the silt & floating oil gets separated from the flow. This oil is manually removed by scrapping from the top of the Chamber and then overflows into the filtering chamber. The filtering chamber consists of pebbles, which further filters the rainwater before diverting it into the recharge well.

**Filter Media in Rain Water Harvesting Pit**

The Filter is used to remove suspended pollutant from rainwater collected. A filter unit is a chamber filled with filtering media such as course sand, Gravels, etc. to remove suspended material before it enters the recharge structure.

**Recharge Structure**

Rain water will be charged into ground water aquifers through recharge structure. It conducts water to a greater depth from where it joins the ground water.

**Size of Various Units**

The proposed design for the recharge pit is shown in below figure.

Rain water harvesting location is shown in Map 2.2. The existing underground tank of 20 KL can be used as collection tank.

![Rainwater harvesting diagram](image)

**Rainwater harvesting Quantity**

<table>
<thead>
<tr>
<th>Description</th>
<th>Area</th>
<th>Rain fall in Meter</th>
<th>Run off Coefficient</th>
<th>Total in M³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof top area of building/sheds</td>
<td>9410</td>
<td>0.922</td>
<td>0.85</td>
<td>7374.62</td>
</tr>
</tbody>
</table>
Average recharge of rail water annually is 13,699.17 m\(^3\). Under ground storage tank is 20 m\(^3\) and fill four times in the season so that net annual recharge of ground water is 13,420 m\(^3\) from plant premises.
WATER RECHARGE REQUIRED OUTSIDE SITE

Requirement of Water Recharge outside Site

Water Recharge Quantity requirement : 207 kld (Annually-75,555 m³)
Water recharge at site : 36.76 kld (Annually - 13,420 m³)

Balance quantity of Water recharge required outside site: (207 - 36.76) = 170.24 kld = 62,138 m³ annually

So, the unit is planning to recharge Ground water at Katol Village in Katol Pond.

Proposal of Water Recharge in Katol Pond

This is possible to harvest rainwater in nearby village- Katol.

It is proposed to construct good storm water channel to divert water from village roads & within village. The purpose is to collect storm water drainage to pond in order to meet the requirement & storage rain water in to the pond.

This proposal is given below in the report.

Factors to be Considered to Rainwater Recharge

The quantity of rainfall which will be diverted to the pond will depend on following factors;

- Catchment Area
- Annual Rainfall
- Run-off co-efficient

Catchment Area

The catchment area of the village in three direction w.r.t the pond including connecting roads is as follows;
D 0-1: Google Image Showing Catchment Area and Katol Village

- Area of North side of Katol pond = 12277.11 sq m
- Area of West Side of Katol pond = 3730.60 sq m
- Area of Road side of Katol Village = 2227.39 sq. m
- Area of North side slope of land = 100659.92 sq. m
- Area of South side slope of land = 28342.43 sq. m

So the total area is 147,237.45 sq.m.

Rainfall Quantity

The average rainfall/annum is 922 mm.

Run-off Co-efficient

Average Run-off coefficient is considered as 0.6.

Quantity to be Recharged

Quantity of Rainfall which can be recharged;
Quantity of Water = Area x Avg. Rainfall in meter x Run off co-efficient

So the total new quantity of water to be recharged = 147237.45 m³ x 0.922 m x 0.6
= 81,452 m³
So, total water recharge: 223 kl per day

**Proposal of Engineer**

- Pucca storm water drainage system will be designed to divert water from the village to existing pond.
- Suitable lining will be constructed to the pond made of stone/brick pitching.
- The storm water will be passed through filters & then 2 nos. of tube wells for rain water harvesting.
- In case of heavy floods, the storm water which will overflow from filtration tank will be diverted to existing talao.

The block diagram for the same is shown below;

![Block Diagram](image.png)

**Recharge in Ground water**

In monsoon period, hardly 0.2 to 0.3m of water is stored in pond but as per above proposal we will develop network of run off and store about 81,452 m³ of new rain water in the pond. That will increase the water depth about 1 to 1.5m as per ground profile. About average three months of water will be stored in the pond. Recharge rate is considered to be 4 liter per second. Calculation of recharge structure is as follows:

Recharge of ground water through one well = 4 x 60 x 60 x 24 x 120

= 41472000 liters (41472 m³)

Two recharge wells will be developed in pond premises
CONCLUSION

Considering above proposal we have developed network of run off from village to pond. About 81,452 m³ of new runoff will be recharged in groundwater.

At site : 36.76 kld (Annually - 13,420 m³)
At Katol Village Pond : 223 kl per day (Annually 81,452 m³)

So we can recharge about 94,872 m³ of ground water which forms about 62% of withdrawal from ground.