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# GIS Based Assessment and Evaluation of the Environmental Impacts of Opencast Coal Mining in Raniganj Coalfield, West Bengal, India

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***Abstract:*** *The Raniganj coalfieldoverlies the granite plateau ring of Choto Nagpur in the Damodar valley region surrounded by the Durgapur-Asansol industrial belt with a general elevation of about 100 meters. Origin of coal was of Permian age, estimated to be 205 to 108 million years old in Raniganj and Barakar stages of Gondwana age. The study area Khottadih and Sonepur Bazari are one of the biggest OC Projects in Raniganj coalfield commenced on 1982 and 1990 respectively. In due course oftime,these OCPshave been producing enormous coal with very quickness. But it degrades the environment vastly. In order to find out the environmental degradation in this area, spatial and temporal variations of suspended particulate matter (SPM) and daily noise of air have measured on a regular basis. Volumetric filtration and gravimetric weighing methods have been used to explore the SPM.Alongside the daily noise have been measured by using pulsar digital sound level meter. To show the local morphological changes, land degradation have been measured by calculating the reduced level (RL) using total station. It was found that SPM is 124.9 µgm$^3$higher than the normal. Simultaneously the manmade difference in elevation is maximum 154.6 m. It clearly denotes that the environment around the mines have altered through the time due to mining activities, since the inception. This huge amount of environmental loss which associated with opencast mining are generally excluded from financial appreciation of opencast project. The mining authority is not animate about the degradation, they are busy for production. By using hedonic pricing method the researcher tries to explore the amount of environmental degradation due to opencast coal mining and provide cost upon them. In the past35 yearsRs 295.49 Crore rupees is the cost of environmental degradation. The mining authority should include this environmental cost in the financial appreciation.Because this monetary environmental costs of these projects could be sufficient to reduce sustainability and its economic viability. In Arc GIS several mathematical algorithms like Inverse Distance Weighted (IDW), Thiessen Polygon and Kriging have been used to show the environmental cost. The main objective of this study is to estimate the costs of these environmental impacts and compare them to the benefits of coal extraction.*

***Keywords:*** *environmental cost, hedonic pricing method, hidden prices, spatial and temporal variation in air quality, local morphology, mathematical algorithms, regression model, willingness to pay*

## I. Introduction

If we consider environment as a goods, then it belongs to everybody but belongs to no body. Therefore protection of environment is one of the principal concerns in the 21St century and is likely to dominate political interest in the coming years.Open cast mining is a surface mining technique of extracting rock or minerals from the earth by their removal from an open pit. Opencast mines are performed when deposits of commercially useful minerals or rock are found near the surface; that is where the overburden (surface materials covering the mineral) is relatively thin or the tunneling is not possible. Opencast mining is more effective than almost all types of mining because of more ore can be extracted with very quickness. The working conditions are safer for the miners because there is no risk of cave in or toxic gas, low production cost and increasing labor efficiency. Therefore opencast mining is gaining popularity decade by decade. But it generates noise, dust, adverse visual impact, degraded land and not least the long-term environmental damage which can be caused to rural areas even after restoration. Thereafter, the tension between the environmental loss and the profitability of opencast coal mining is debatable. Raniganj Coalfield, which falls under E.C.L is the birth place of coal mining in the Country. In 1975 Eastern Coalfields Limited, a Subsidiary of Coal India Limited (C.I.L) was formed and inherited all the private sector coal mines of Raniganj Coalfields. Khottadih and Sonepur Bazari are departmental mines of Eastern Coalfields Limited.Khottadih and Sonepur Bazari OC projects are one of the biggest in Raniganj coalfield. These two regions were situated in a green belt area, where land was used almost entirely for agricultural purposes. Thereafter the abandonment of these two projects would generate adverse environmental impacts. The key question is whether the benefits outweigh the costs, which the researcher attempts to answer via hedonic pricing method. The researcher seeks to identify such a comparison for Khottadih and Sonepur Bazari OC projects, which produced 76.78 million tons coal and 262.43 million tons over burden during past 19 years.

**Location**

The study area is bounded by latitudes 23°39'40.11''N to 23° 44' 21.82''N and longitudes 87° 11' 19.93''E to 87° 16' 54.05''E at an elevation of 98.45m.Total area is 87.15 sq km. The area presents a nearly flat topography with broad undulation. The area is sloping gently. Mean elevation is 98.45m.

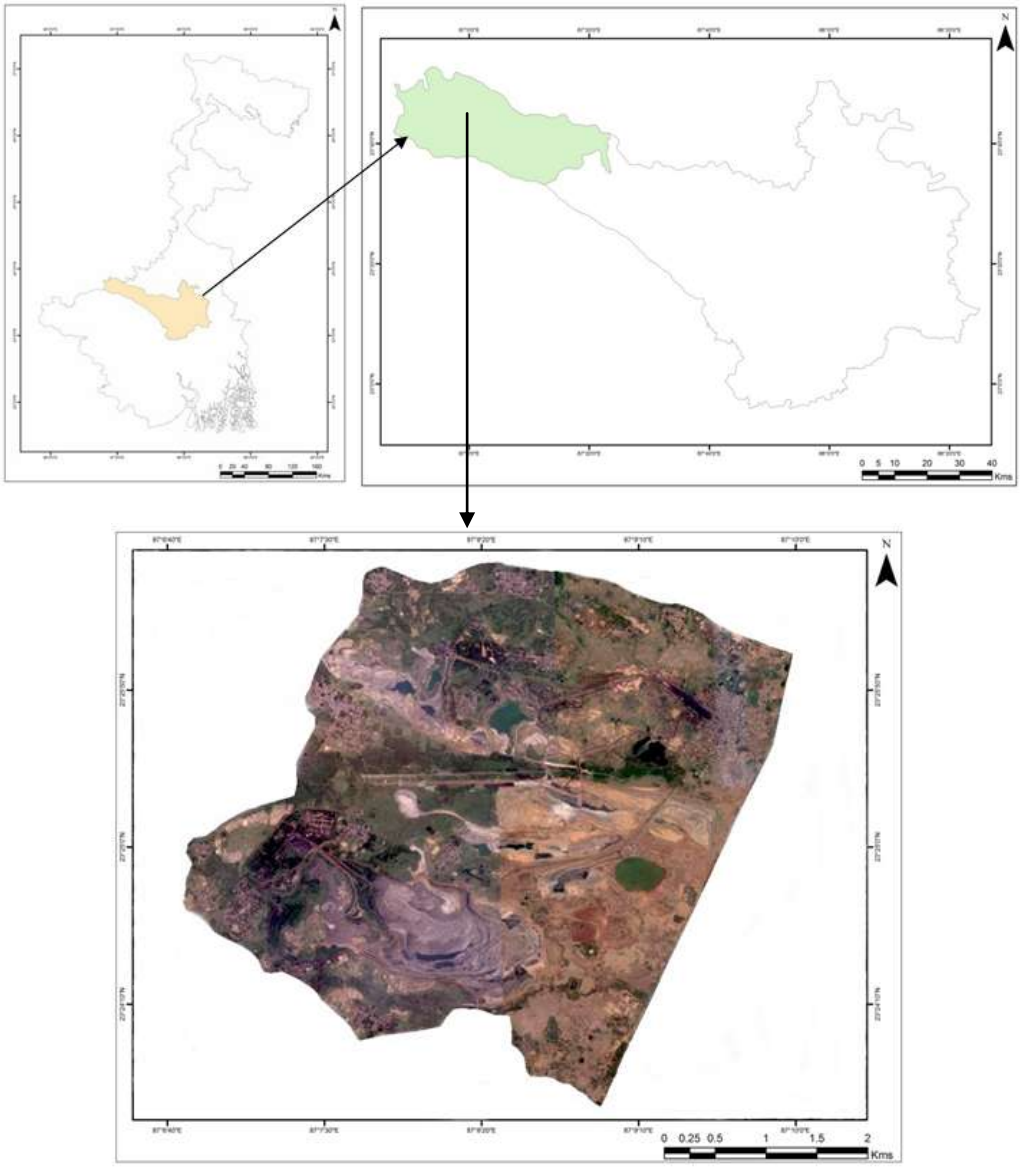

**Figure1:** Location Map of the Study Area

## II. Methods

The researcher introduces several techniques to investigate the problems associated with the estimation of hidden prices for opencast mines.

**4.1 Wage studies / Value ofhealth risks:** Use information on risk premium to value people willingness to pay to avoid hazards.

P = f (s1. s2. s3… si; n1, n2. n3… nj; e1, e2, e3 ... ej)

Where

s1. s2. s3… si are the structural variables

n1, n2. n3… nj are the neighborhood variables

e1, e2, e3 ... ejare environmental variables

The hedonic price method of environmental valuation uses surrogate markets for placing a value on environmental quality. The technique uses the effects of the project as a proxy for its environmental costs. The Hedonic Price Method is a revealed preference method of valuation. This method interprets market goods as a bundle of characteristics. The structural features like type of house, age of house, and house with concrete roof

or not. The neighborhood characteristics includes existence of amenities, local transportation and distance from OCP, the accessibility of the location. Environmental characteristics are health of air, availability of vegetation and status of landuse usually delineated by location

**4.2 Air pollution:** Air pollution and noise have a direct impact on property value. The method employed for collection of suspended particulate matter is by volumetric filtration and gravimetric weighing, where sampling of air through a filter medium at a known flow rate for a specified time is performed. The sampler whose height is around 1.3m is kept at the ground level so as to mimic the average height of the human respiratory organ i.e. the nose. A conditioned and pre weighed glass fibre filter and a cyclone cup are placed in their appropriate mounting in the air sampler. The sampler timer is set for eight hours. The monometer is also adjusted for the right flow rate (i.e. $1Lmin^{-1}$) and the initial flow rate is noted down after five minutes of starting. The suspended particles enter the cyclone where coarse non-respirable (NRSPM) is separated from the air steam by centrifugal force. It falls through the cyclone's conical hopper and gets collected in the pre weighed whatman glass microfiber filter paper (GF/A 20.3*25.4 cm). At the end of the sampling process the final flow rate is again noted down and the RSPM collected the GF filter paper and the NRSPM collected in the cyclonic cup are weighed using an electronic top loading weighing balance. The concentration of particulate matter is estimated on the net mass collected divided by the volume of air sampled. The amount of non-respirable suspended particulate matter (NRSPM) is added to the amount of respirable suspended particulate matter (RSPM) for calculation of suspended particulate matter (SPM). (Pand A et al., 2012)
On the contrary daily noise was measured by using Digital Sound Level Meter.

**4.3 Land Degradation:**To detect the overall changes in elevation and to find out the degradation of land, total station have been used. During the total station survey several things were measured. These are horizontal angle, vertical angle, slope, horizontal difference, difference, easting, northing and height.

**4.4 Algorithms in Arc GIS:** In Arc GIS software,two mathematical algorithms have been used for interpolation purposes. Inverse Distance Weighted (IDW) a method for multivariate interpolation, a process of assigning values to unknown points by using values from usually scattered set of known points.
Thiessen Polygon tool converts input points to an output feature class of thiessen proximal polygons. It has the unique property that each polygon contains only one input point, and any location within a polygon is closer to its associated point than to the point of any other polygon.
**4.5 Google Earth:**Satellite image of the study area was taken from google earth. It is a quick bird image and spatialresolution is m. Date of acquired on 14th April, 2016, 08:12 am IST.

## III. About the Mine

Two OC mines have been selected for analysis namely Khottadih and Sonepur Bazari. These two mines belong to Raniganj coalfield and are the departmental mine of Eastern Coalfields Limited. Here mining is done by shovel dumper combination. The salient features of these projects are as under.
**5.1 Khottadih OC Project:** Khottadih OC project is part of Pandaveswar area, located within latitude 23° 23' 59.''N to 23° 29' 30''N and longitude longitudes 87° 04' 10''E to 87° 12' 25''EIt was commenced in 1982. This ocp issituated at the downfield area of Raniganj coalfield. Coal is being extracted from Rv and Rvi seams at the depth of 50m. Total leased area of this project is 334.5 hectare (including UG project). Where total opencast project area is 6.4 hectare. Backfilling process has been completed at the southern part of this OCP. Stripping ratio is 1:4.33. This project will run further 5 years (estimate) from 2016. In 2014 and 2015 25000 plants have been planted. Laterite soil is enormously found at the surface of this mine. 34 dumpers, 7 dozers and 8 shovels are continuously worked in this OCP.
**5.2 Sonepur Baari OC Project:** Sonepur Bazari OC project is part of Sonepur Bazari area, located within latitude 23° 39' 40.''N to 23° 42' 10''N and longitude longitudes 87° 11' 0''E to 87° 16' 16''E. It is the biggest OCP of Raniganj coalfield commenced in 1990. Total working area of the project is 1575.40 hectare. Coal is being extracted from Rii to Rviii seams at the depth of 150m. The quality of coal is G4. Stripping ratio of this OCP is 1:4.72. According to 2014 estimate the mine has a total reserve of 172.86 million tons, a life of 58 years. Diversion of river is seen in this OCP. Since the birth, 225500 plants are planted and total planted area is 92.5 hectare. 63 dumpers, 17 dozers and 13 shovels and 1 dragline are continuously worked in this OCP.

**6. Valuation ofEnvironmental Impacts and Costs**

There is no precise method by which environment can be measured directly in term of financial cost. Hence, the researcher explores quality of air and decay of land to facilitate the comparison of land price as a proxy of environmental degradation.

**6.1 Air Quality Management**: A study for assessment and management of suspended particulate matter of air was carried out on a regular basis by drawing samples from 15th September to 05th October 2016 from Pandaveswar, Khottadih and Sonepur Bazari areas by using the above mentioned method.
Daily noise is also measured from seven different stations of the study area on an irregular basis in 23rd August 2015, 10th November 2015 and 15th March 2015. The test results are compared with the standards prescribed by the MOEF.

**6.2 Land Degradation:** To detect the overall land degradation of the study area caused by mining activities, the author calculates the Reduced Level value of Sonepur Bazari OCP. With the help of total Station, RL is measured at different points of these two mines to enhance the height. In Sonepur Bazari mine, 445 points are collected as sample. After these,interpolation algorithms is performed to present the continuous surface elevation of the area. This continuous surface of the mines will give us a transparent concept about the degradation.

## IV. Result and Discussion

To assess the environmental costs of Khottadih and Sonepur Bazari mines for the production of opencast coal, the researcher examined the temporal variation of Suspended Particulate Matter. Figure 2shows the comparison of SPM concentrationamong Pandaveswar, Khottadih and Sonepur Bazari area. During this survey, SPM was recorded highest in Sonepur Bazari and Khottadih area. Because these two region are opencast mining area. Highest SPM found at Sonepur area is 274.9 µgm3, at Khottadih it is 267.4 µgm3. Lowest SPM was recorded in Pandaveswar area, because it is a residential area. Average SPM is 123.85 µgm3 at Pandaveswar. On 23rd August, 2015 noise was recorded highest in Training Centre that is 54.2 decibels and lowest is 41.8 at Dahuka. On the contrary on 10th November, 2015 highest noise was 54.2 and lowest 42.8 at Kenda.According to National Ambient Air Quality Standards, UK, annual desirable SPM in industrial area is 150 µgm3, in residential and rural areas it is 100µgm3 and sensitive area it is 60µgm3. Thereafter the results sharply indicate that the health of air is not good enough in those areas except Pandaveswar. Because enormous suspended particles are there in the air due to excavation, digging, and transportation of mining vehicles and lack of air pollution prevention measures.

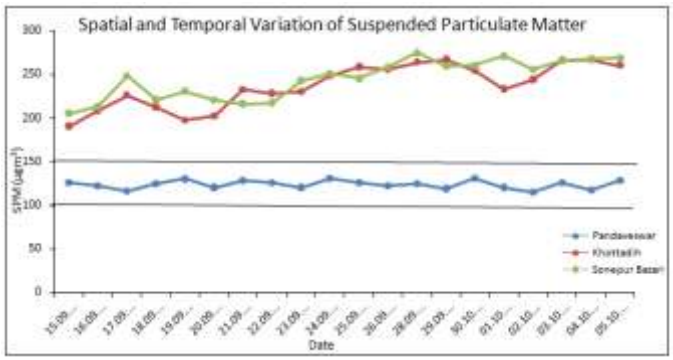


**Figure 2:** Spatial and Temporal Variations of Suspended Particulate Matter in three Stations

Figure 3 shows the spatial and temporal variations of daily noise in seven different areas in three different periods.The result shows that, noise is under desirable rate. But the crucial thing is that throughout the day the dwellers suffer from above mentioned noise generated from mining activities.

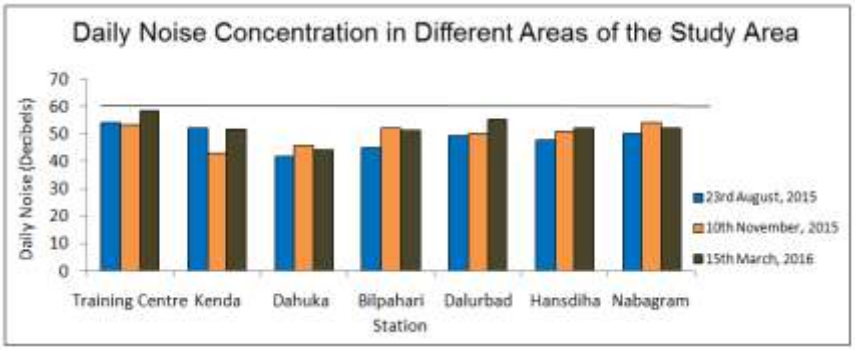


**Figure 3:** Daily Noise Concentration of the Study Area

Figure 4 shows the suspended particulate matter Concentration map. It is a theissan polygon map. Where the three regions denotes different pollution level. It clearly indicates that, dark coloured area is highly polluted in termsof SPM concentration of air that is 244.5 $\mu gm^3$in and adjoining area of Sonepur Bazari OC project. It is Khottadih OC project and its adjoiniung area, which is moderately polluted and average SPM concentration is 237.45 $\mu gm^3$. These two areas are sharply polluted due to opencast mining activities. In Pandaveswar area the SPM concentration of air is optimum that is 123.85 $\mu gm^3$, because it is a residential area. The observed value has successfully validated. Total shape area of highly polluted, moderately polluted and less polluted area is 0.000315, 0.000679 and 0.000625 respectively.

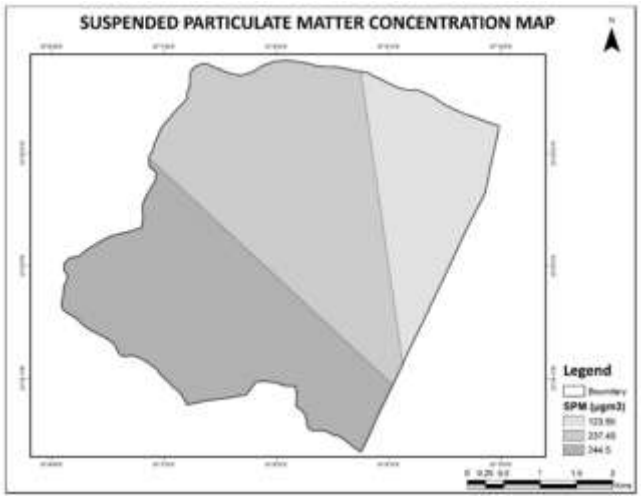


**Figure 4:** Suspended Particulate Matter Concentration Map

It is found that during 1998 to 2016 Khottadih mine produces 16.12 million tons coal, 40.38 million tons over burden. During this time total expenditure of this mine was 297.93 crore rupees. The coal was sold in Rs 3085.61 crore rupees. Therefore in this period the mine profits Rs 2787.65 crore rupees. During 1998 to 2016 Sonepur Bazari mine produces 60.66 million tonnes coal, 222.05 million tonnes over burden. During this time total expenditure of this mine was 399.43 crore rupees. Extracted coal was sold in Rs 11611.25 crore rupees. Therefore, in this period the mine profits Rs 11211.82 crore rupees. Figure 5 represents the elevation map of Sonepur Bazari mine. By using IDW algorithm in Arc GIS, this continues surface elevation map is prepared. In the map, the lighter colour indicates lowest elevation that is about -42.55 m, on the contrary dark colour indicates highest elevation that is about 188.58 m. The test result strongly denotes that this oc project has huge amount of degradation that the researcher has identified through the surface elevation mapping. Huge amount of land degradation is continuously occurred here due to rapid excavation and overburden dumping. Coal is being extracted here from 150 m depth.

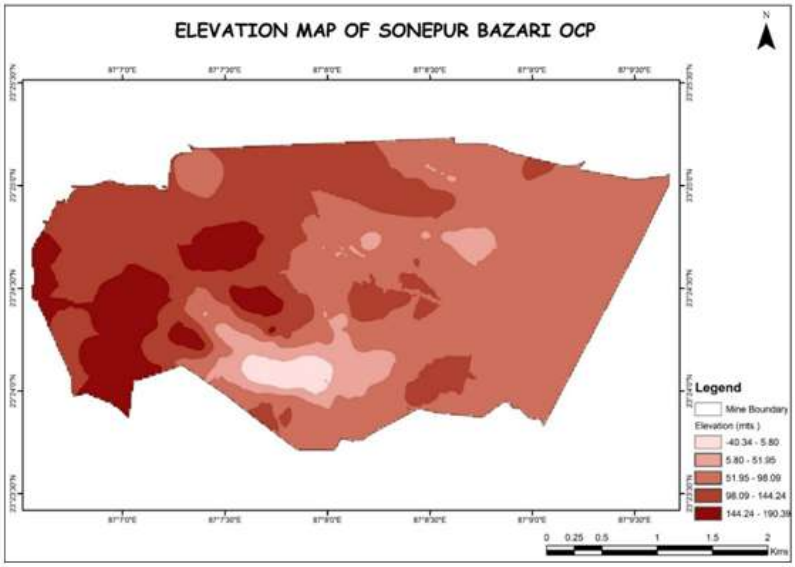


**Figure 5:** Elavation Map of Sonepur Bazari OC Project

## V. Findings

The goal of this study is to find out the environmental cost due to opencast mining. The method employed for measure the environmental cost is hedonic pricing method, where land value is used as a proxy of environmental degradation. For this purposes air pollution and land degradation taken into account. Because these two pollution have a direct impact on the land value. The researcher concentrates on the possible impact on land quality in the surrounding villages of the mine. An estimate of the possible impacts was made via a survey during June 2016 and August 2016.Specific questionwas asked during the interviews to consider four types of property, valued at Rs 20000, Rs 60000, Rs 100000 and Rs 200000. For each category question was asked, 'by how do you think the value of such a property has been changedfrom 1980 to 2016?'Some land belongs to Eastern Coalfields Limited, thereafter, the researcher got enough data from ECL too. All interviews considered that opencast mining in Khottadih and Sonepur Bazari areas have been a miscellaneous effect on house and land pricesduring last 36 years. It is argued that the health of environment is getting poor in the area due to opencast mining. But in some areas like Pandaveswar it is found that land prices increase due to development purposes associated with mining. It should be kept in mind that the Khottadih and Sonepur Bazari areas are very inaccessiblearea from the dawn. Therefore the rate of average fall in land prices due to air pollution is low compare to other developed countries.The average falls in house prices for each of these areas are reported in table 1. Overall land prices have been fall by between 15to 40 percent. In Sonepur area land of worth Rs 120000 is adversely affected, fall is 33.33%. In pandaveswar area land value increases; vastly increased land is worth Rs 300000 that is 66.67%. Khottadih is the most severely affected area.Highest decreased land is worth Rs 100000 that is 40%.

**Table 1:** Average rise and fall ofLand Prices

| Property Value (Rupees) | Sonepur Bazari | | | Pandaveswar | | | Khottadih | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1980 | 2016 | % | 1980 | 2016 | % | 1980 | 2016 | % |
| 20000 | 20000 | 17000 | 15 | 15000 | 20000 | 25 | 20000 | 15000 | 25 |
| 60000 | 40000 | 50000 | 25 | 50000 | 80000 | 37.5 | 50000 | 50000 | 25 |
| 100000 | 120000 | 80000 | 33.33 | 80000 | 150000 | 46.67 | 100000 | 60000 | 40 |
| 200000 | 200000 | 150000 | 25 | 300000 | 500000 | 66.67 | 150000 | 100000 | 33.33 |

To identify people's marginal willingness to pay for healthy environment the researcher used pollution level and price of land to get the trend of willingness. First of all the researcher sorts Suspended Particulate Matters (SPM), daily noise and land degradation into higher to lower value. Then add them together to get one value. It is independent variable denotes level of pollution and placed at x axis. Price of land is sorted from greater to smaller value. It is dependent variable and placed at y axis. Then questions were asked to people that, 'how much would you like to pay to avoid pollution and to get healthy environment?' Seven different stations were selected for this survey. Pollution level 0 indicates no air pollution and 300 denotes maximum pollution. The researcher formed a trend line by using polynomial order 3 on the basis of two variables. The trend line sharply indicates that peoples are willing to pay higher price for pollution free land and not so much interested to pay for polluted environment. Properties across a range of values are confirmed by the strong negative correlation between the pollution level and property values. This result is also consistent with the expectation that money valuations of environmental impacts should be an increasing function of individual income.

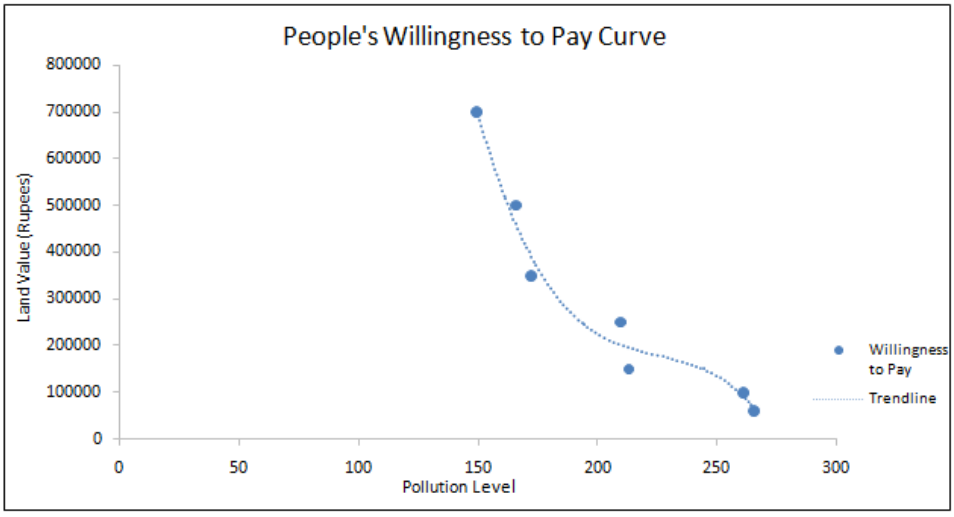


**Figure 6:** People's Willingness to Pay Curve

The researcher identified affected areas due to mining activities on map shown in figure 7. This map is prepared by using the data of table 1 and hedonic pricing method in Arc GIS. Test results indicate that villagers of Sonepur Bazari and Khottadih areas have been most severely affected because of their close proximity to the mine site shown on the map with saddle browncolour. Bengal Para village in Sonepur Bazari and Sukhbazar village in Khottadih are the most severely affected villages. Here the land value is from Rs 60000 to Rs 100000 per cotta. Moderately affected areas are Kenda, Dalurbad, Nabagram, Dahuka etc shown on map with dark goldenrodand pale goldenrod colour. Here the value of land is from Rs 100000 to Rs 200000 per cotta. The value of land in Pandaveswar and its adjoining area is higher due to the existence of railway station, large market and other facilities provided by ECL shown on map with steel blue colour. Price of land in this area is above Rs 400000 per cotta. Apart from these Bilpahari, Hansdiha, Kumarkhala etc are the low or moderately price valued land due to unhealthy environment. Here the price of land for cotta is from Rs 60000 to Rs 300000.

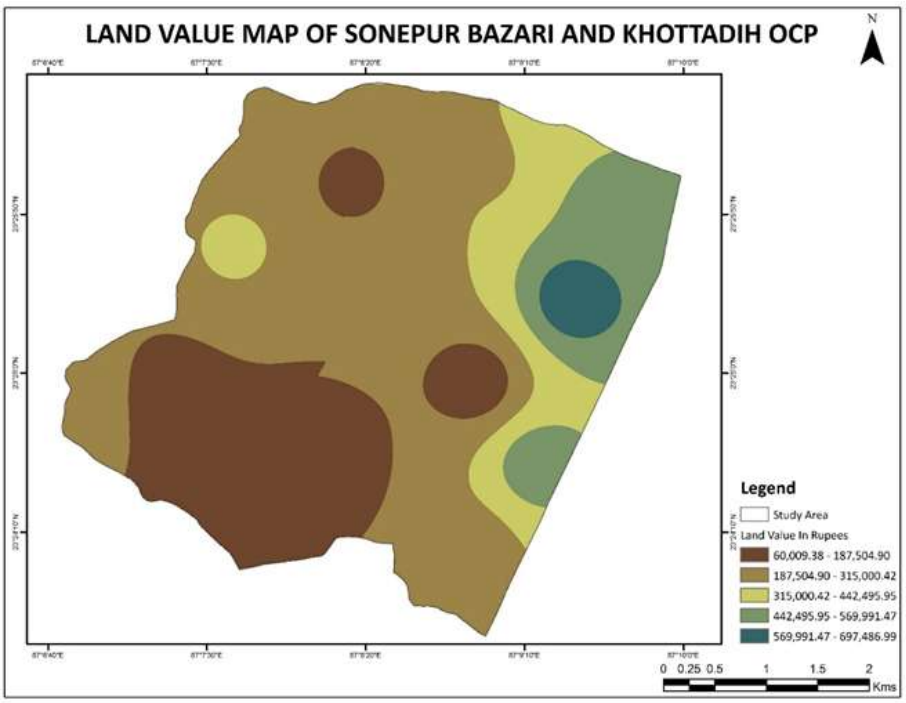


**Figure 7:** Land Value Map of Sonepur Bazari and Khottadih OCP

In order to aggregate the overall profit and effect of this project, it is needed to calculate the investment of OCPs and environmental cost caused by mining. It is very easy to get the investment and benefit of the projects. But the environmental cost is very difficult to get. Because the researcher don't has any precise procedure by which environmental cost can be measured. Therefore the researcher used price of land as a proxy for environmental degradation. It is very helpful to get the price of environment degradation by going to hedonic pricing method. The environmental costis calculated by summing all prices of land shown in table 1 and considering the hedonic method, which have been decreasing since the commencement of the project due to pollution. By multiplying the decreased price of land during 26 years with area the researcher gets the hidden or environmental cost. Table 2 shows a comparison of these costs with the benefits from coal production. The first balance sheet compares the profits of Khottadih and Sonepur Bazari sites with costs. Here total costs during this abovementioned period are Rs 711.37 crore and profitsare Rs 14696.86 crore. Thereafter the net benefit from these opencast sites are Rs 13999.5 crore.Net economic benefits have been gained from these sites, which excludes the environmental costs.

On the contrary, the second balance sheet compares the environmental costs with the benefits provided by the opencast sites. Here total cost is increased into Rs 1092.848 crore due to the addition of environmental or hidden cost.Total calculated environmental costsare Rs 395.488 crore. The net benefits are Rs 13604.012 crore. This means that, once the environmental costs of opencast mining are taken into account, therefore the net benefits of the project are decreased. This decreased amount is the cost of environment. Indeed the researcher postulated thatin Khottadih and Sonepur Bazari OC Projects,the production of coal by using opencast technique is environmentally costly.

**Table 2:** Comparisons of Costs and Benefits

| **Balance Sheet 1 (Rs Crore)** | | **Balance Sheet 2 (Rs Crore)** | |
|---|---|---|---|
| Profits | 14696.86 | Profits | 14696.86 |
| Costs | 697.36 | Costs | 1092.848 |
| Net Benefits | 13999.5 | Net Benefits | 13604.012 |

## VI. Conclusion

In the Indian coal industry the dependence on opencast mining has been increased rapidly during the last two decades due to mechanization and modernization of mining operation. The large opencast mines have advantage of low gestation period and higher recovery of coal and are more amenable to heavy mechanization and modern technologies than underground mines, thus ensuring speed and economy in implementation. But after intensive studies the researcher has found that the environmental costs, valued in terms of the effect on land prices, as high as Rs 395.488 Crore. This reduces a significant proportion of profit, which ECL can make from these two sites. Environmental costs provide a lower estimate because landprices only shadow part of the fall in amenity value from the site and the researcher has not assembled the full menu of environmental degradation. The environmental costs indicate that opencast mining is not perfectly desirable in Khottadih and Sonpur Bazari areas because the environmental costs are huge enough and it reduces sufficient amount of benefits.Opencast coal from these areas most probably costly to produce than UG-mined coal. Although the researcher did not explore the UG mining. The researcher only excludes the air pollution from the cost, thereafter it can be argued that UG mining could be better option than opencast technique in order to prevent the pollution along with sustainable site development.

However, if UG mining cannot be possible due to unfavourable geological condition and the authority will have to go for opencast mining, then several techniques should be employed to arrest the air pollution and land degradation like developed countries. These are—air borne dust should be suppressed by sprinkling water on the main haul roads and other roads of the mine where vehicles play, wet drilling and provision of dust collector in drilling machine, water sprinkling at the various points of the CHP where coal is handled, sufficient numbers of dust extractors have been provided in CHP. In opencast technique literally it is impossible to check the land degradation. But we can reduce it to some extent by using proper backfilling techniques and plantation of herbs and trees.It can be said that People of Khottadih area have adjusted with the polluted environment. They often argued that colliery is the source of life here. They are entirely depended on mining. Pollution does not play any role in their life. Because ECL provides enormous facilities to them.If this researchwouldhave
been done in a developed country, to my opinion the environmental cost will be increased.Indeed the disturbance caused by the opencast mine lasted for few years after closing of the project. Land prices could start to return back to their original levels towards the end of a site's life cycle.

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## 12. Appendices

**Table 3:** Production of coal and overburden and Investment of Khottadih OCP

| Year | Coal (million tons) | Overburden (million tons) | Investment (Rs Crore) |
|---|---|---|---|
| 1998 | 0.18 | 1.27 | 20.08 |
| 1999 | 0.35 | 1.87 | 24.75 |
| 2000 | 0.65 | 2.07 | 20.38 |
| 2001 | 0.70 | 2.14 | 22.69 |
| 2002 | 0.80 | 2.21 | 14.12 |
| 2003 | 0.80 | 2.78 | 13.80 |
| 2004 | 0.63 | 3.01 | 15.25 |
| 2005 | 0.55 | 2.23 | 14.20 |
| 2006 | 0.50 | 2.40 | 13.68 |
| 2007 | 0.52 | 2.40 | 14.00 |
| 2008 | 0.59 | 2.84 | 14.50 |
| 2009 | 0.62 | 2.73 | 13.58 |
| 2010 | 0.72 | 3.08 | 15.00 |
| 2011 | 0.52 | 3.29 | 16.30 |
| 2012 | 0.75 | 2.30 | 17.80 |
| 2013 | 1.50 | 1.21 | 12.25 |
| 2014 | 1.70 | 0.54 | 13.20 |
| 2015 | 2.04 | 1.01 | 12.35 |
| 2016 (projected) | 2.00 | 1 | 10 |

**Table 4:** Production of coal and overburden and Investment of Sonepur BazarI OCP

| Year | Coal (million tons) | Overburden (million tons) | Investment (Rs Crore) |
|---|---|---|---|
| 1998 | 2.70 | 14.12 | 25.60 |
| 1999 | 2.75 | 14.20 | 27.60 |
| 2000 | 3.00 | 13.80 | 30.24 |
| 2001 | 3.10 | 13.23 | 23.25 |
| 2002 | 3.13 | 12.09 | 27.54 |
| 2003 | 3.06 | 11.95 | 28.26 |
| 2004 | 3.12 | 11.28 | 24.56 |
| 2005 | 3.02 | 11.04 | 25.63 |
| 2006 | 3.16 | 11.26 | 22.63 |
| 2007 | 3.47 | 11.05 | 18.56 |
| 2008 | 3.40 | 10.43 | 19.54 |
| 2009 | 3.28 | 10.42 | 17.26 |
| 2010 | 3.20 | 10.10 | 16.32 |
| 2011 | 2.88 | 10.12 | 14.23 |
| 2012 | 3.41 | 9.96 | 16.23 |
| 2013 | 3.42 | 10.65 | 15.25 |
| 2014 | 3.75 | 12.04 | 16.23 |
| 2015 | 3.31 | 12.31 | 15.50 |
| 2016 (projected) | 3.50 | 12.00 | 15 |

**Table 5:** Concentration of Suspended Particulate Matter in Pandaveswar

| Sl No | Location and Date | Starting Time | Stopping Time | Total Time in Hrs | Monometer Reading | | Filter Paper Weight | | Cyclone Cup Weight | | Conc of RSPM ($\mu gm^3$) | Conc of NRSPM ($\mu gm^3$) | Total SPM conc. ($\mu gm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Initial Reading | Final Reading | Initial g | Final g | Initial g | Final g | | | |
| 1 | Pandaveswar 15.09.2016 | 09:30 am | 05:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.350 | 84.5 | 41.8 | 126.3 |
| 2 | Pandaveswar 16.09.2016 | 09:30 am | 05:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.635 | 96.2 | 26.1 | 122.3 |
| 3 | Pandaveswar 17.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.601 | 69.5 | 46.8 | 116.3 |
| 4 | Pandaveswar 18.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.624 | 80.2 | 44.6 | 124.8 |
| 5 | Pandaveswar 19.09.2016 | 09:30 am | 05:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.647 | 48.1 | 82.5 | 130.6 |
| 6 | Pandaveswar 20.09.2016 | 09:30 am | 05:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.350 | 79.1 | 41.2 | 120.3 |
| 7 | Pandaveswar 21.09.2016 | 09:30 am | 05:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 90.7 | 37.9 | 128.6 |
| 8 | Pandaveswar 22.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 81.3 | 44.9 | 126.2 |
| 9 | Pandaveswar 23.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 84.2 | 36.2 | 120.4 |
| 10 | Pandaveswar 24.09.2016 | 09:30 am | 05:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 64.8 | 66.1 | 130.9 |
| 11 | Pandaveswar 25.09.2016 | 09:30 am | 05:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 74.2 | 51.7 | 125.9 |
| 12 | Pandaveswar 26.09.2016 | 09:30 am | 05:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 70.6 | 51.9 | 122.5 |
| 13 | Pandaveswar 28.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 67.2 | 57.4 | 124.6 |
| 14 | Pandaveswar 29.09.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 70.9 | 48.5 | 119.4 |
| 15 | Pandaveswar 30.09.2016 | 09:30 am | 05:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 80.9 | 49.1 | 130.9 |
| 16 | Pandaveswar 01.10.2016 | 09:30 am | 05:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 68.2 | 52.4 | 120.6 |
| 17 | Pandaveswar 02.10.2016 | 09:30 am | 05:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 64.2 | 51 | 115.2 |
| 18 | Pandaveswar 03.10.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 76.5 | 49.4 | 125.9 |
| 19 | Pandaveswar 04.10.2016 | 09:30 am | 05:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 72.4 | 44.8 | 117.2 |
| 20 | Pandaveswar 05.10.2016 | 09:30 am | 05:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 70.6 | 57.9 | 128.5 |

**Table 6:** Concentration of Suspended Particulate Matter in Khottadih OCP

| Sl No | Location and Date | Starting Time | Stopping Time | Total Time in Hrs | Monometer Reading | | Filter Paper Weight | | Cyclone Cup Weight | | Conc of RSPM ($\mu gm^3$) | Conc of NRSPM ($\mu gm^3$) | Total SPM conc. ($\mu gm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Initial Reading | Final Reading | Initial g | Final g | Initial g | Final g | | | |
| 1 | Khottadih OC 15.09.2016 | 08:30 am | 04:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 120.5 | 70.1 | 190.6 |
| 2 | Khottadih OC 16.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 150.2 | 58.2 | 208.4 |
| 3 | Khottadih OC 17.08.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 157.3 | 69.2 | 226.5 |
| 4 | Khottadih OC 18.09.2016 | 08:30 am | 04:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 120.5 | 92 | 212.5 |
| 5 | Khottadih OC 19.09.2016 | 08:30 am | 04:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 98.2 | 99.2 | 197.4 |
| 6 | Khottadih OC 20.09.2016 | 08:30 am | 04:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 110.2 | 92.1 | 202.3 |
| 7 | Khottadih OC 21.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 132.2 | 100.5 | 232.7 |
| 8 | Khottadih OC 22.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 160.5 | 68.1 | 228.6 |
| 09 | Khottadih OC 23.09.2016 | 08:30 am | 04:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 170.2 | 60.1 | 230.3 |
| 10 | Khottadih OC 24.09.2016 | 10:30 am | 04:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 186.3 | 62.3 | 248.6 |
| 11 | Khottadih OC 25.09.2016 | 08:30 am | 04:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 189.3 | 69.2 | 258.5 |
| 12 | Khottadih OC 26.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 180.2 | 76.1 | 256.3 |
| 13 | Khottadih OC 28.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 130.5 | 133.7 | 264.2 |
| 14 | Khottadih OC 29.09.2016 | 08:30 am | 04:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.647 | 120.6 | 146.2 | 266.8 |
| 15 | Khottadih OC 30.09.2016 | 08:30 am | 04:30 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.350 | 130.3 | 124.3 | 254.6 |
| 16 | Khottadih OC 01.09.2016 | 08:30 am | 04:30 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.635 | 132.1 | 100.8 | 232.9 |
| 17 | Khottadih OC 02.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.601 | 164.3 | 79.9 | 244.2 |
| 18 | Khottadih OC 03.09.2016 | 08:30 am | 04:30 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.624 | 157.5 | 109 | 266.5 |
| 19 | Khottadih OC 04.09.2016 | 08:30 am | 04:30 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.647 | 152.5 | 114.9 | 267.4 |
| 20 | Khottadih OC 05.09.2016 | 08:30 am | 04:30 pm | 8 | 1.06 | 1.05 | 2.793 | 2.836 | 12.610 | 12.624 | 159.3 | 101.2 | 260.5 |

**Table 7:** Concentration of Suspended Particulate Matter in Sonepur BazariOCP

| Sl No | Location and Date | Starting Time | Stopping Time | Total Time in Hrs | Monometer Reading | | Filter Paper Weight | | Cyclone Cup Weight | | Conc of RSPM ($\mu gm^3$) | Conc of NRSPM ($\mu gm^3$) | Total SPM conc. ($\mu gm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Initial Reading | Final Reading | Initial g | Final g | Initial g | Final g | | | |
| 1 | Sonepur Bazari OC 15.09.2016 | 11:00 am | 07:00 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.350 | 96.4 | 108.4 | 204.8 |
| 2 | Sonepur Bazari OC 16.09.2016 | 11:00 am | 07:00 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.635 | 123.2 | 89.5 | 212.7 |
| 3 | Sonepur Bazari OC 17.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.601 | 130.6 | 118 | 248.6 |
| 4 | Sonepur Bazari OC 18.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.624 | 130.2 | 90.4 | 220.6 |
| 5 | Sonepur Bazari OC 19.09.2016 | 11:00 am | 07:00 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.647 | 121.9 | 108.7 | 230.6 |
| 6 | Sonepur Bazari OC 20.09.2016 | 11:00 am | 07:00 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.350 | 123.8 | 96.7 | 220.5 |
| 7 | Sonepur Bazari OC 21.09.2016 | 11:00 am | 07:00 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 120.5 | 95.4 | 215.9 |
| 8 | Sonepur Bazari OC 22.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 132.6 | 84.3 | 216.9 |
| 9 | Sonepur Bazari OC 23.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 147.3 | 95.3 | 242.6 |
| 10 | Sonepur Bazari OC 24.09.2016 | 11:00 am | 07:00 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 156.4 | 94.4 | 250.8 |
| 11 | Sonepur Bazari OC 25.09.2016 | 11:00 am | 07:00 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 150.6 | 95 | 245.6 |
| 12 | Sonepur Bazari OC 26.09.2016 | 11:00 am | 07:00 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 163.2 | 95 | 258.2 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Sonepur Bazari OC 28.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 174.1 | 100.8 | 274.9 |
| 14 | Sonepur Bazari OC 29.09.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 168.2 | 91 | 259.2 |
| 15 | Sonepur Bazari OC 30.10.2016 | 11:00 am | 07:00 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 159.3 | 100.9 | 260.2 |
| 16 | Sonepur Bazari OC 01.10.2016 | 11:00 am | 07:00 pm | 8 | 1.04 | 1.05 | 2.783 | 2.807 | 12.635 | 12.635 | 156.2 | 114.5 | 270.7 |
| 17 | Sonepur Bazari OC 02.10.2016 | 11:00 am | 07:00 pm | 8 | 1.06 | 1.05 | 2.799 | 2.830 | 12.580 | 12.601 | 148.7 | 107.1 | 255.8 |
| 18 | Sonepur Bazari OC 03.10.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.793 | 2.836 | 12.610 | 12.624 | 161.3 | 104.3 | 265.6 |
| 19 | Sonepur Bazari OC 04.10.2016 | 11:00 am | 07:00 pm | 8 | 1.07 | 1.04 | 2.784 | 2.801 | 12.616 | 12.647 | 174.3 | 93 | 267.3 |
| 20 | Sonepur Bazari OC 05.10.2016 | 11:00 am | 07:00 pm | 8 | 1.08 | 1.08 | 2.800 | 2.823 | 12.319 | 12.350 | 170.8 | 97.7 | 268.5 |

**Table 8:** Daily Noise measurement in the study area

| **Station** | **Noise (Decibels per day)** | | |
|---|---|---|---|
| | **23rd August, 2015** | **10th November, 2015** | **15th March, 2016** |
| Training Centre | 54.2 | 53.3 | 58.5 |
| Kenda | 52.3 | 42.8 | 50.8 |
| Dahuka | 41.8 | 45.7 | 43.2 |
| Bilpahari | 44.8 | 52.0 | 51.6 |
| Dalurbad | 49.5 | 50.1 | 55.1 |
| Hansdiha | 47.9 | 50.8 | 52.0 |
| Nabagram | 50.1 | 54.2 | 52.4 |

**Table 9:** Total Station Reading of Sonepur Bazari OC Project

| **Sl No** | **Location (DMS)** | **RL (mts)** | **Sl No** | **Location (DMS)** | **RL (mts)** |
|---|---|---|---|---|---|
| 1 | 23° 24’ 7.37’’N 87° 06’ 54.04’’E | 145 | 24 | 23° 24’ 16.36’’N 87° 07’ 14.69’’E | 160 |
| 2 | 23° 24’ 9.32’’N 87° 06’ 53.25’’E | 166.54 | 25 | 23° 24’ 15.63’’N 87° 07’ 16.82’’E | 157.8 |
| 3 | 23° 24’ 10.65’’N 87° 06’ 53.25’’E | 170.12 | 26 | 23° 24’ 14.20’’N 87° 07’ 17.63’’E | 155.05 |
| 4 | 23° 24’ 11.68’’N 87° 06’ 51.54’’E | 163.57 | 27 | 23° 24’ 12.63’’N 87° 07’ 18.64’’E | 140.25 |
| 5 | 23° 24’ 12.36’’N 87° 06’ 49.52’’E | 150.38 | 28 | 23° 24’ 11.36’’N 87° 07’ 18.69’’E | 140.35 |
| 6 | 23° 24’ 53.65’’N 87° 07’ 0.66’’E | 165.45 | 29 | 23° 24’ 10.65’’N 87° 07’ 17.42’’E | 101.61 |
| 7 | 23° 24’ 7.85’’N 87° 07’ 01.63’’E | 168.96 | 30 | 23° 24’ 09.36’’N 87° 07’ 15.52’’E | 99.82 |
| 8 | 23° 24’9.65’’N 87° 07’ 0.61’’E | 162.12 | 31 | 23° 24’ 07.63’’N 87° 07’ 11.69’’E | 149.5 |
| 9 | 23° 24’ 52.36’N 87° 07 09.36’’E | 171.58 | 32 | 23° 24’ 09.36’’N 87° 07’ 12.67’’E | 107.11 |
| 10 | 23° 24’ 9.56’’N 87° 06’ 54.04’’E | 166.57 | 33 | 23° 24’ 06.31’’N 87° 07’ 07.63’’E | 155 |
| 11 | 23° 24’ 7.37’’N 87° 06’ 57.20’’E | 150.13 | 34 | 23° 24’ 08.56’’N 87° 07’ 21.65’’E | 77.07 |
| 12 | 23° 24’ 16.01’’N 87° 06’ 51.80’’E | 143.19 | 35 | 23° 24’ 7.24’’N 87° 07’ 21.52’’E | 77.8 |
| 13 | 23° 24’ 18.63’’N 87° 06’ 51.52’’E | 146.11 | 36 | 23° 24’ 7.37’’N 87° 07’ 22.51’’E | 74.13 |
| 14 | 23° 24’ 18.63’’N 87° 06’ 56.32’’E | 168.64 | 37 | 23° 24’ 7.69’’N 87° 07’ 23.85’’E | 66.8 |
| 15 | 23° 24’ 17.63’’N 87° 07’ 07.65’’E | 162.96 | 38 | 23° 23’ 58.65’’N 87° 07’ 58.65’’E | 67.36 |
| 16 | 23° 24’ 15.36’’N 87° 07’ 09.63’’E | 116.95 | 39 | 23° 24’ 10.36’’N 87° 07’ 39.51’’E | 22.99 |
| 17 | 23° 24’ 13.25’’N 87° 07’ 09.74’’E | 118.1 | 40 | 23° 24’ 01.21’’N 87° 07’ 41.51’’E | 25.39 |
| 18 | 23° 24’ 12.01’’N 87° 07’ 10.63’’E | 112.13 | 41 | 23° 24’ 02.36’’N 87° 07’ 41.36’’E | -2.53 |
| 19 | 23° 24’ 15.20’’N 87° 07’ 11.58’’E | 131.76 | 42 | 23° 23’ 57.52’’N 87° 07’ 44.21’’E | 79.04 |
| 20 | 23° 24’ 10.25’’N 87° 07’ 14.26’’E | 102.52 | 43 | 23° 23’ 53.24’’N 87° 07’ 41.95’’E | 98 |
| 21 | 23° 24’ 11.26’’N 87° 07’ 15.69’’E | 137.5 | 44 | 23° 23’ 57.94’’N 87° 07’ 45.32’’E | 96 |
| 22 | 23° 24’ 11.56’’N 87° 07’ 17.94’’E | 133.22 | 45 | 23° 23’ 53.36’’N 87° 07’ 41.26’’E | 96 |
| 23 | 23° 24’ 12.08’’N 87° 07’ 11.12’’E | 138.2 | 46 | 23° 23’ 55.24’’N 87° 07’ 44.36’’E | 96 |
| 47 | 23° 23’ 57.69’’N 87° 07’ 40.36’’E | 98 | 110 | 23° 24’ 14.69’’N 87° 08’ 07.26’’E | 64.76 |
| 48 | 23° 23’ 56.36’’N 87° 07’ 43.15’’E | 98 | 111 | 23° 24’ 12.58’’N 87° 07’ 54.05’’E | 30.01 |
| 49 | 23° 23’ 57.36’’N 87° 07’ 35.85’’E | 96 | 112 | 23° 24’ 13.68’’N 87° 07’ 52.47’’E | 29.52 |
| 50 | 23° 23’ 55.26’’N 87° 07’ 37.54’’E | 96 | 113 | 23° 24’ 14.82’’N 87° 07’ 51.45’’E | 88.73 |
| 51 | 23° 23’ 56.23’’N 87° 07’ 56.58’’E | 96 | 114 | 23° 24’ 16.36’’N 87° 07’ 58.90’’E | 68.94 |
| 52 | 23° 23’ 51.24’’N 87° 07’ 51.64’’E | 94 | 115 | 23° 24’ 16.57’’N 87° 07’ 58.24’’E | 59.45 |
| 53 | 23° 23’ 55.36’’N 87° 07’ 45.63’’E | 94 | 116 | 23° 24’ 17.36’’N 87° 07’ 58.67’’E | 59.66 |
| 54 | 23° 23’ 57.25’’N 87° 07’ 48.56’’E | 94 | 117 | 23° 24’ 16.27’’N 87° 07’ 56.14’’E | 70.18 |
| 55 | 23° 23’ 49.25’’N 87° 08’ 05.96’’E | 80.25 | 118 | 23° 24’ 16.45’’N 87° 07’ 56.78’’E | 68.86 |
| 56 | 23° 23’ 50.36’’N 87° 08’ 09.24’’E | 79.92 | 119 | 23° 24’ 18.45’’N 87° 07’ 58.78’’E | 60.42 |
| 57 | 23° 23’ 52.36’’N 87° 08’ 09.87’’E | 79.34 | 120 | 23° 24’ 19.67’’N 87° 07’ 58.45’’E | 63.56 |
| 58 | 23° 23’ 52.46’’N 87° 08’ 09.61’’E | 67.05 | 121 | 23° 24’ 17.68’’N 87° 07’ 17.54’’E | 61.44 |
| 59 | 23° 23’ 53.24’’N 87° 08’ 11.28’’E | 67.04 | 122 | 23° 24’ 16.57’’N 87° 07’ 53.58’’E | 70.81 |
| 60 | 23° 23’ 55.98’’N 87° 08’ 14.64’’E | 82.15 | 123 | 23° 24’ 15.67’’N 87° 07’ 52.78’’E | 71.2 |

| | | | | | |
|---|---|---|---|---|---|
| 61 | 23° 23’ 58.64’’N 87° 08’ 14.85’’E | 73.48 | 124 | 23° 24’ 13.57’’N 87° 07’ 53.04’’E | 65.9 |
| 62 | 23° 23’ 58.45’’N 87° 08’ 11.28’’E | 54.73 | 125 | 23° 24’ 11.58’’N 87° 07’ 53.67’’E | 17.26 |
| 63 | 23° 23’ 56.87’’N 87° 08’ 08.32’’E | 64.39 | 126 | 23°24’10.45’’N 87° 076’ 51.45’’E | 16.99 |
| 64 | 23° 23’ 58.67’’N 87° 08’ 57.21’’E | 52.4 | 127 | 23° 24’ 13.57’’N 87° 07’ 50.89’’E | 62.36 |
| 65 | 23° 23’ 56.36’’N 87° 08’ 06.57’’E | 54.82 | 128 | 23° 24’ 13.27’’N 87° 07’ 48.59’’E | 62.31 |
| 66 | 23° 23’ 55.98’’N 87° 08’ 02.28’’E | 56.97 | 129 | 23° 24’ 13.89’’N 87° 07’ 46.87’’E | 60.71 |
| 67 | 23° 23’ 56.87’’N 87° 08’ 06.85’’E | 59.38 | 130 | 23° 24’ 15.68’’N 87° 07’ 49.54’’E | 91.77 |
| 68 | 23° 23’58.69’’N 87° 08’ 03.29’’E | 60.53 | 131 | 23° 24’ 15.89’’N 87° 07’ 50.68’’E | 93.93 |
| 69 | 23° 24’ 0.36’’N 87° 08’ 07.63’’E | 16.24 | 132 | 23° 24’ 16.57’’N 87° 07’ 49.67’’E | 90.38 |
| 70 | 23° 24’ 02.36’’N 87° 08’ 09.31’’E | 21.05 | 133 | 23° 24’ 17.65’’N 87° 07’ 48.04’’E | 97.37 |
| 71 | 23° 24’ 01.36’’N 87° 08’ 06.48’’E | 21.05 | 134 | 23° 24’ 18.65’’N 87° 07’ 52.68’’E | 97.4 |
| 72 | 23° 24’ 01.36’’N 87° 08’ 03.65’’E | 25.78 | 135 | 23° 24’ 15.89’’N 87° 07’ 48.69’’E | 106.55 |
| 73 | 23° 24’ 02.54’’N 87° 08’ 04.20’’E | 30.14 | 136 | 23° 24’ 16.67’’N 87° 07’ 47.52’’E | 106.12 |
| 74 | 23° 24’ 02.98’’N 87° 08’ 02.52’’E | 15.25 | 137 | 23° 24’ 16.48’’N 87° 07’ 46.82’’E | 106.6 |
| 75 | 23° 24’ 02.39’’N 87° 08’ 02.94’’E | 16.62 | 138 | 23° 24’ 15.61’’N 87° 07’ 45.97’’E | 66.4 |
| 76 | 23° 24’ 02.69’’N 87° 07’ 59.67’’E | 5.799 | 139 | 23° 24’14.20’’N 87° 07’ 45.00’’E | 68.48 |
| 77 | 23° 24’ 02.64’’N 87° 07’ 58.97’’E | -9.01 | 140 | 23° 24’ 15.00’’N 87° 07’ 43.62’’E | 59.937 |
| 78 | 23° 24’ 03.52’’N 87° 07’ 59.75’’E | 14.23 | 141 | 23° 24’ 15.36’’N 87° 07’ 42.39’’E | 79.89 |
| 79 | 23° 24’ 03.36’’N 87° 08’ 0.0’’E | -8.13 | 142 | 23° 24’ 16.35’’N 87° 07’ 44.85’’E | 118.47 |
| 80 | 23° 24’ 04.34’’N 87° 08’01.68’’E | 11.824 | 143 | 23° 24’ 16.95’’N 87° 07’ 44.20’’E | 118.45 |
| 81 | 23° 24’ 04.98’’N 87° 08’ 02.98’’E | 23.378 | 144 | 23° 24’ 14.21’’N 87° 07’ 40.63’’E | 57.59 |
| 82 | 23° 24’ 04.28’’N 87° 08’ 0.69’’E | -9.02 | 145 | 23° 24’ 11.08’’N 87° 07’ 39.84’’E | 15.84 |
| 83 | 23° 24’ 02.67’’N 87° 07’ 56.09’’E | -7.46 | 146 | 23° 24’ 10.67’’N 87° 07’ 39.67’’E | 19.27 |
| 84 | 23° 24’ 03.64’’N 87° 07’ 55.28’’E | -12.34 | 147 | 23° 24’ 10.21’’N 87° 07’ 41.69’’E | 21.86 |
| 85 | 23° 24’ 03.69’’N 87° 07’ 52.48’’E | -33.09 | 148 | 23°24’10.68’’N 87° 07’ 42.694’’E | 14.84 |
| 86 | 23° 24’ 04.57’’N 87° 07’ 57.52’’E | -8.37 | 149 | 23° 24’ 9.67’’N 87° 07’ 42.04’’E | 8.14 |
| 87 | 23° 24’ 04.25’’N 87° 07’ 54.08’’E | -31.43 | 150 | 23° 24’ 08.34’’N 87° 07’ 44.69’’E | 1.48 |
| 88 | 23° 24’ 05.69’’N 87° 07’ 57.36’’E | -17.26 | 151 | 23° 24’ 7.37’’N 87° 07’ 43.04’’E | -19 |
| 89 | 23° 24’ 09.65’’N 87° 07’ 59.68’’E | -13.14 | 152 | 23° 24’ 24.69’’N 87° 07’ 47.68’’E | 15.84 |
| 90 | 23° 24’ 04.26’N 87° 07’ 59.87’’E | -5.942 | 153 | 23° 24’08.36’’N 87° 07’ 46.85’’E | 8.47 |
| 91 | 23° 24’ 04.69’’N 87° 08’ 04.69’’E | 32.26 | 154 | 23° 24’ 07.28’’N 87° 07’ 39.61’’E | -42.55 |
| 92 | 23° 24’ 06.98’’N 87° 08’ 04.78’’E | 38.03 | 155 | 23° 24’09.36’’N 87° 07’ 48.69’’E | -12.34 |
| 93 | 23° 24’ 06.51’’N 87° 08’ 0.24’’E | -2.89 | 156 | 23° 24’ 04.32’’N 87° 07’ 44.04’’E | -23.39 |
| 94 | 23° 24’ 05.64’’N 87° 08’ 05.61’’E | 2.04 | 157 | 23° 24’ 05.32’’N 87° 07’ 44.14’’E | -39.37 |
| 95 | 23° 24’ 06.23’’N 87° 07’ 58.52’’E | -18.09 | 158 | 23° 24’ 05.32’’N 87° 07’ 46.98’’E | -22.47 |
| 96 | 23° 24’ 05.26’’N 87° 07’ 56.98’’E | -19.85 | 159 | 23° 24’ 03.68’’N 87° 07’ 38.58’’E | -27.5 |
| 97 | 23° 24’ 06.35’’N 87° 08’ 0.04’’E | 0.55 | 160 | 23° 24’ 04.24’’N 87° 07’ 49.58’’E | -28.6 |
| 98 | 23° 24’ 7.37’’N 87° 07’ 03.69’’E | 29.365 | 161 | 23° 24’ 02.34’’N 87° 07’ 46.57’’E | -26.6 |
| 99 | 23° 24’ 08.24’’N 87° 08’ 05.92’’E | 42.43 | 162 | 23° 24’ 09.35’’N 87° 07’ 48.04’’E | -3.51 |
| 100 | 23° 24’ 08.30’’N 87° 08’ 04.56’’E | -15.03 | 163 | 23° 24’ 17.64’’N 87° 07’ 43.57’’E | 199.29 |
| 101 | 23° 24’ 09.52’’N 87° 07’ 56.98’’E | -12 | 164 | 23° 24’ 18.57’’N 87° 07’ 42.85’’E | 118.98 |
| 102 | 23° 24’ 10.39’’N 87° 07’ 57.04’’E | 21.34 | 165 | 23° 24’ 16.37’’N 87° 07’ 36.81’’E | 58.09 |
| 103 | 23° 24’ 11.96’’N 87° 07’ 54.04’’E | 19.99 | 166 | 23° 24’ 20.68’’N 87° 07’ 44.29’’E | 124.01 |
| 104 | 23° 24’ 11.60’’N 87° 07’ 56.89’’E | 25.58 | 167 | 23° 24’ 19.37’’N 87° 07’ 47.68’’E | 118.91 |
| 105 | 23° 24’ 05.69’’N 87° 08’ 05.69’’E | 33.29 | 168 | 23° 24’ 20.67’’N 87° 07’ 49.84’’E | 132.31 |
| 106 | 23° 24’ 11.24’’N 87° 08’ 05.63’’E | 9.72 | 169 | 23° 24’ 19.37’’N 87° 07’ 35.98’’E | 78 |
| 107 | 23° 24’ 12.01’’N 87° 08’ 05.78’’E | 21.83 | 170 | 23° 24’ 18.37’’N 87° 07’ 32.08’’E | 58.55 |
| 108 | 23° 24’ 12.09’’N 87° 08’ 0.07’’E | 23.66 | 171 | 23° 24’ 15.84’’N 87° 07’ 31.48’’E | 29.11 |
| 109 | 23° 24’ 12.98’’N 87° 07’ 06.98’’E | 55.84 | 172 | 23° 24’ 23.28’N 87° 07’ 39.58’’E | 165.83 |
| 173 | 23° 24’ 23.87’’N 87° 07’ 72.29’’E | 164.93 | 236 | 23° 24’ 41.35’’N 87° 07’ 39.26’’E | 140 |
| 174 | 23° 24’ 24.89’’N 87° 07’ 48.67’’E | 137.02 | 237 | 23° 24’ 41.35’’N 87° 07’ 35.97’’E | 176.15 |
| 175 | 23° 24’ 24.58’’N 87° 07’ 38.59’’E | 166.15 | 238 | 23° 24’ 40.29’’N 87° 07’ 33.68’’E | 176.01 |
| 176 | 23° 24’ 26.52’’N 87° 07’ 39.46’’E | 167.35 | 239 | 23° 24’ 39.65’’N 87° 07’ 32.68’’E | 173 |
| 177 | 23° 24’ 26.87’’N 87° 07’ 46.27’’E | 148.49 | 240 | 23° 24’ 38.26’’N 87° 07’ 30.54’’E | 170 |
| 178 | 23° 24’ 26.34’’N 87° 07’ 45.25’’E | 146.55 | 241 | 23° 24’ 38.29’’N 87° 07’ 27.59’’E | 171 |
| 179 | 23° 24’ 27.26’’N 87° 07’ 51.04’’E | 150.22 | 242 | 23° 24’ 37.59’’N 87° 07’ 25.92’’E | 171 |
| 180 | 23° 24’ 29.68’’N 87° 07’ 42.68’’E | 147.73 | 243 | 23° 25’ 08.25’’N 87° 08’ 11.26’’E | 116.9 |
| 181 | 23° 24’ 30.28’’N 87° 07’ 41.58’’E | 151.49 | 244 | 23° 24’ 51.26’’N 87° 08’ 51.68’’E | 110.05 |
| 182 | 23° 24’ 30.58’’N 87° 07’ 39.74’’E | 148.53 | 245 | 23° 24’ 56.37’’N 87° 08’ 51.68’’E | 106.85 |
| 183 | 23° 24’ 32.78’’N 87° 07’ 37.57’’E | 122.45 | 246 | 23° 24’ 57.68’’N 87° 08’ 17.36’’E | 110.71 |
| 184 | 23° 24’ 31.25’’N 87° 07’ 35.28’’E | 127.93 | 247 | 23° 24’ 58.26’’N 87° 08’ 16.29’’E | 112.87 |
| 185 | 23° 24’ 28.57’’N 87° 07’ 33.09’’E | 167.1 | 248 | 23° 24’ 59.36’’N 87° 08’ 20.29’’E | 114.91 |
| 186 | 23° 24’ 26.58’’N 87° 07’ 38.24’’E | 166.1 | 249 | 23° 24’ 59.25’’N 87° 08’ 18.26’’E | 115.57 |
| 187 | 23° 24’ 26.37’’N 87° 07’ 33.04’’E | 165.1 | 250 | 23° 24’ 55.29’’N 87° 08’ 13.27’’E | 111.38 |
| 188 | 23° 24’ 25.58’’N 87° 07’ 35.52’’E | 167.1 | 251 | 23° 24’ 55.28’’N 87° 08’ 15.29’’E | 110.31 |
| 189 | 23° 24’ 24.09’’N 87° 07’ 31.58’’E | 100.21 | 252 | 23° 24’ 54.86’’N 87° 08’ 17.24’’E | 110.52 |
| 190 | 23° 24’ 23.52’’N 87° 07’ 27.58’’E | 81.3 | 253 | 23° 24’ 54.29’’N 87° 08’ 19.29’’E | 112.64 |
| 191 | 23° 24’ 23.58’’N 87° 07’ 29.04’’E | 80.75 | 254 | 23° 24’ 53.48’’N 87° 08’ 20.95’’E | 112.48 |
| 192 | 23° 24’ 22.24’’N 87° 07’ 33.57’’E | 101.78 | 255 | 23° 24’ 57.32’’N 87° 08’ 20.65’’E | 108.75 |
| 193 | 23° 24’ 28.57’’N 87° 07’ 28.97’’E | 130.29 | 256 | 23° 24’ 58.29’’N 87° 08’ 23.52’’E | 117.63 |

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| 194 | 23° 24’ 30.96’’N 87° 07’ 28.69’’E | 128.2 | 257 | 23° 24’ 56.98’’N 87° 08’ 25.68’’E | 117.69 |
| 195 | 23° 24’ 21.85’’N 87° 07’ 25.36’’E | 96 | 258 | 23° 24’ 55.29’’N 87° 08’ 26.54’’E | 107.57 |
| 196 | 23° 24’ 22.67’’N 87° 07’ 25.94’’E | 37.25 | 259 | 23° 24’ 53.26’’N 87° 08’ 25.68’’E | 114.01 |
| 197 | 23° 24’ 18.25’’N 87° 07’ 28.57’’E | 29.13 | 260 | 23° 24’ 53.85’’N 87° 08’ 23.68’’E | 108.96 |
| 198 | 23° 24’ 17.28’’N 87° 07’ 26.85’’E | 55.63 | 261 | 23° 24’ 52.68’’N 87° 08’ 26.37’’E | 114.2 |
| 199 | 23° 24’ 16.52’’N 87° 07’ 25.84’’E | 84.33 | 262 | 23° 24’ 53.26’’N 87° 08’ 22.52’’E | 113.81 |
| 200 | 23° 24’ 17.08’’N 87° 07’ 23.27’’E | 98.13 | 263 | 23° 24’ 53.26’’N 87° 08’ 30.67’’E | 104.8 |
| 201 | 23° 24’ 15.67’’N 87° 07’ 22.21’’E | 150.83 | 264 | 23° 24’ 53.57’’N 87° 08’ 30.52’’E | 107.1 |
| 202 | 23° 24’ 13.08’’N 87° 07’ 23.21’’E | 158.48 | 265 | 23° 24’ 53.27’’N 87° 08’ 30.29’’E | 101.2 |
| 203 | 23° 24’ 17.28’’N 87° 07’ 20.61’’E | 158.83 | 266 | 23° 24’ 53.92’’N 87° 08’ 35.64’’E | 98.541 |
| 204 | 23° 24’16.27’’N 87° 07’ 18.63’’E | 153.05 | 267 | 23° 24’ 54.29’’N 87° 08’ 30.64’’E | 104.36 |
| 205 | 23° 24’ 12.57’’N 87° 07’ 22.36’’E | 158.84 | 268 | 23° 24’ 54.68’’N 87° 08’ 32.26’’E | 118.12 |
| 206 | 23° 24’ 13.57’’N 87° 07’ 20.36’’E | 151.62 | 269 | 23° 24’ 55.34’’N 87° 08’ 24.68’’E | 118.51 |
| 207 | 23° 24’ 17.25’’N 87° 07’ 12.68’’E | 134.06 | 270 | 23° 24’ 56.29’’N 87° 08’ 32.58’’E | 116.85 |
| 208 | 23° 24’ 19.35’’N 87° 07’ 08.68’’E | 164.95 | 271 | 23° 24’ 56.38’’N 87° 08’ 33.85’’E | 118.77 |
| 209 | 23° 24’ 21.29’’N 87° 07’ 10.68’’E | 132.72 | 272 | 23° 24’ 56.29’’N 87° 08’ 29.36’’E | 107.45 |
| 210 | 23° 24’ 22.36’’N 87° 07’ 11.68’’E | 130.48 | 273 | 23° 24’ 57.29’’N 87° 08’ 29.58’’E | 107.15 |
| 211 | 23° 24’ 22.36’’N 87° 07’ 08.65’’E | 173.22 | 274 | 23° 24’ 59.59’’N 87° 08’ 26.36’’E | 117.02 |
| 212 | 23° 24’ 22.36’’N 87° 07’ 03.24’’E | 188.18 | 275 | 23° 24’ 59.36’’N 87° 08’ 24.28’’E | 116.84 |
| 213 | 23° 24’ 21.00’’N 87° 07’ 01.58’’E | 188.58 | 276 | 23° 25’ 0.25’’N 87° 08’ 24.25’’E | 116.36 |
| 214 | 23° 24’ 22.36’’N 87° 07’ 0.24’’E | 187.74 | 277 | 23° 24’ 59.25’’N 87° 08’ 22.36’’E | 98.397 |
| 215 | 23° 24’ 23.25’’N 87° 06’ 59.35’’E | 179.53 | 278 | 23° 24’ 58.29’’N 87° 08’ 59.58’’E | 104.36 |
| 216 | 23° 24’ 23.21’’N 87° 06’ 59.84’’E | 181.38 | 279 | 23° 24’ 58.29’’N 87° 08’ 19.39’’E | 111.47 |
| 217 | 23° 24’ 23.29’’N 87° 07’ 03.58’’E | 187.14 | 280 | 23° 25’ 03.25’’N 87° 08’ 15.28’’E | 116.91 |
| 218 | 23° 24’ 25.68’’N 87° 07’ 08.67’’E | 172.68 | 281 | 23° 25’ 02.65’’N 87° 08’ 15.96’’E | 116.91 |
| 219 | 23° 24’ 29.57’’N 87° 07’ 03.24’’E | 169.84 | 282 | 23° 25’ 03.25’’N 87° 08’ 20.28’’E | 114.91 |
| 220 | 23° 24’ 31.27’’N 87° 07’ 03.57’’E | 170.58 | 283 | 23° 25’ 04.21’’N 87° 08’ 21.68’’E | 90.229 |
| 221 | 23° 24’ 33.57’’N 87° 07’ 07.54’’E | 168.5 | 284 | 23° 25’ 05.29’’N 87° 08’ 18.88’’E | 95.676 |
| 222 | 23° 24’ 30.56’’N 87° 07’ 08.21’’E | 169.19 | 285 | 23° 25’ 06.39’’N 87° 08’ 18.68’’E | 96.144 |
| 223 | 23° 24’ 34.28’’N 87° 07’ 04.58’’E | 157.78 | 286 | 23° 25’ 07.59’’N 87° 08’ 20.52’’E | 94.349 |
| 224 | 23° 24’ 34.28’’N 87° 07’ 02.47’’E | 158.49 | 287 | 23° 25’ 06.37’’N 87° 08’ 20.28’’E | 95.364 |
| 225 | 23° 24’ 34.58’’N 87° 06’ 59.38’’E | 140.12 | 288 | 23° 25’ 04.29’’N 87° 08’ 23.62’’E | 86.357 |
| 226 | 23° 24’ 37.28’’N 87° 07’ 01.59’’E | 142.21 | 289 | 23° 25’ 06.25’’N 87° 08’ 24.51’’E | 73.57 |
| 227 | 23° 24’ 36.28’’N 87° 07’ 09.24’’E | 120.11 | 290 | 23° 25’ 06.39’’N 87° 08’ 25.28’’E | 52.83 |
| 228 | 23° 24’ 36.24’’N 87° 07’ 31.58’’E | 140.6 | 291 | 23° 25’ 04.25’’N 87° 08’ 27.58’’E | 59.11 |
| 229 | 23° 24’ 31.57’’N 87° 07’ 25.85’’E | 105.1 | 292 | 23° 25’ 03.25’’N 87° 08’ 27.28’’E | 81.89 |
| 230 | 23° 24’ 35.68’’N 87° 07’ 28.57’’E | 145 | 293 | 23° 25’ 01.55’’N 87° 08’ 29.25’’E | 78.54 |
| 231 | 23° 24’ 34.29’’N 87° 07’ 38.68’’E | 118.28 | 294 | 23° 25’ 01.25’’N 87° 08’ 32.28’’E | 74.57 |
| 232 | 23° 24’ 36.57’’N 87° 07’ 39.26’’E | 138.29 | 295 | 23° 25’ 01.58’’N 87° 08’ 36.40’’E | 43.82 |
| 233 | 23° 24’ 33.59’’N 87° 07’ 40.69’’E | 100.22 | 296 | 23° 25’ 02.68’’N 87° 08’ 37.21’’E | 52.92 |
| 234 | 23° 24’ 33.68’’N 87° 07’ 44.29’’E | 96.31 | 297 | 23° 25’ 03.65’’N 87° 08’ 33.28’’E | 47.87 |
| 235 | 23° 24’ 27.59’’N 87° 07’ 49.25’’E | 133.16 | 298 | 23° 25’ 04.26’’N 87° 08’ 31.95’’E | 46.86 |
| 299 | 23° 25’ 04.62’’N 87° 08’ 35.28’’E | 74.169 | 362 | 23° 24’ 39.64’’N 87° 09’ 19.64’’E | 94 |
| 300 | 23° 25’ 05.23’’N 87° 08’ 32.63’’E | 73.935 | 363 | 23° 24’ 24.67’’N 87° 09’ 16.59’’E | 95 |
| 301 | 23° 25’ 05.27’’N 87° 08’ 29.52’’E | 47.07 | 364 | 23° 24’ 49.67’’N 87° 09’ 20.42’’E | 87 |
| 302 | 23° 25’ 07.25’’N 87° 08’ 28.24’’E | 75.658 | 365 | 23° 24’ 41.38’’N 87° 09’ 15.69’’E | 96 |
| 303 | 23° 25’ 0.21’’N 87° 08’ 36.22’’E | 61.56 | 366 | 23° 24’ 41.68’’N 87° 09’ 15.94’’E | 73.17 |
| 304 | 23° 24’ 59.32’’N 87° 08’ 36.29’’E | 83.94 | 367 | 23° 24’ 04.68’’N 87° 08’ 13.67’’E | 27.08 |
| 305 | 23° 24’ 58.36’’N 87° 08’ 39.62’’E | 62.46 | 368 | 23° 24’ 05.26’’N 87° 08’ 13.67’’E | 36.57 |
| 306 | 23° 24’ 58.24’’N 87° 08’ 39.24’’E | 74.847 | 369 | 23° 24’ 05.67’’N 87° 08’ 16.89’’E | 27.95 |
| 307 | 23° 24’ 58.24’’N 87° 08’ 24.24’’E | 69.74 | 370 | 23° 24’ 03.67’’N 87° 08’ 16.34’’E | 94 |
| 308 | 23° 24’ 55.27’’N 87° 08’ 37.95’’E | 95.251 | 371 | 23° 24’ 08.64’’N 87° 08’ 25.68’’E | 90.13 |
| 309 | 23° 24’ 56.62N 87° 08’ 36.20’’E | 109.41 | 372 | 23° 24’ 11.68’’N 87° 08’ 25.67’’E | 80.93 |
| 310 | 23° 24’ 55.51’’N 87° 08’ 45.69’’E | 79.29 | 373 | 23° 24’ 09.15’’N 87° 08’ 23.46’’E | 68.28 |
| 311 | 23° 24’ 56.97’’N 87° 08’ 48.29’’E | 73.89 | 374 | 23° 24’ 10.67’’N 87° 08’ 24.48’’E | 74.86 |
| 312 | 23° 24’ 57.58’’N 87° 08’ 45.81’’E | 67.34 | 375 | 23° 24’ 11.68’’N 87° 08’ 23.64’’E | 68.7 |
| 313 | 23° 24’ 57.45’’N 87° 08’ 45.68’’E | 63.81 | 376 | 23° 24’ 12.26’’N 87° 08’ 21.89’’E | 51.01 |
| 314 | 23° 24’ 56.89’’N 87° 08’ 52.16’’E | 77.63 | 377 | 23° 24’ 12.09’’N 87° 08’ 21.65’’E | 53.75 |
| 315 | 23° 24’ 58.65’’N 87° 08’ 53.54’’E | 79.27 | 378 | 23° 24’ 08.65’’N 87° 08’ 16.45’’E | 43.21 |
| 316 | 23° 24’ 59.64’’N 87° 08’ 47.59’’E | 57.51 | 379 | 23° 24’ 09.34’’N 87° 08’ 18.85’’E | 44.02 |
| 317 | 23° 25’ 05.68’’N 87° 08’ 52.64’’E | 89 | 380 | 23° 24’ 10.67’’N 87° 08’ 15.97’’E | 44.24 |
| 318 | 23° 25’01.67’’N 87° 08’ 52.27’’E | 87.73 | 381 | 23° 24’ 09.21’’N 87° 08’ 14.57’’E | 45.05 |
| 319 | 23° 25’ 04.56’’N 87° 08’ 55.94’’E | 85 | 382 | 23° 24’ 08.69’’N 87° 08’ 12.48’’E | 36.24 |
| 320 | 23° 25’ 02.39’’N 87° 08’ 58.67’’E | 101.87 | 383 | 23° 24’ 13.64’’N 87° 08’ 18.67’’E | 60.345 |
| 321 | 23° 25’ 0.35’’N 87° 09’ 04.35’’E | 85 | 384 | 23° 24’ 14.68’’N 87° 08’ 19.49’’E | 63.875 |
| 322 | 23° 25’ 0.9’N 87° 09’ 04.68’’E | 94.67 | 385 | 23° 24’ 15.49’’N 87° 08’ 20.46’’E | 63.575 |
| 323 | 23° 25’ 0.65’’N 87° 09’ 06.34’’E | 95.22 | 386 | 23° 24’ 15.98’’N 87° 08’ 22.47’’E | 83.02 |
| 324 | 23° 24’ 56.24’’N 87° 09’05.28’’E | 86 | 387 | 23° 24’ 15.68’’N 87° 08’ 23.15’’E | 92.24 |
| 325 | 23° 24’ 52.68’’N 87° 09’ 13.59’’E | 87 | 388 | 23° 24’ 13.47’’N 87° 08’ 23.49’’E | 55.45 |
| 326 | 23° 24’ 45.57’’N 87° 08’ 13.68’’E | 43.032 | 389 | 23° 24’ 15.89’’N 87° 08’ 16.85’’E | 65.17 |

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| 327 | 23° 24’ 45.67’’N 87° 08’ 16.69’’E | 55.066 | 390 | 23° 24’ 17.36’’N 87° 08’ 15.79’’E | 77.25 |
| 328 | 23° 24’ 44.38’’N 87° 08’ 11.49’’E | 55.449 | 391 | 23° 24’ 15.98’N 87° 08’ 17.64’’E | 78.27 |
| 329 | 23° 24’ 44.62’’N 87° 08’ 22.68’’E | 50.429 | 392 | 23° 24’ 18.69’’N 87° 08’ 17.49’’E | 74.21 |
| 330 | 23°24’31.67’’N 87° 08’ 321.69’’E | 77.16 | 393 | 23° 24’ 21.49’’N 87° 08’ 16.98’’E | 76.18 |
| 331 | 23° 24’ 43.62’’N 87° 08’ 24.65’’E | 88.877 | 394 | 23° 24’ 21.48’’N 87° 08’ 16.85’’E | 98.76 |
| 332 | 23° 24’ 43.68’’N 87° 08’ 25.49’’E | 74.515 | 395 | 23° 24’ 20.18’N 87° 08’ 12.89’’E | 97.33 |
| 333 | 23° 24’ 43.67’’N 87° 08’ 28.64’’E | 72.071 | 396 | 23° 24’ 21.49’’N 87° 08’ 08.79’’E | 102.1 |
| 334 | 23° 24’ 43.89’’N 87° 08’ 28.49’’E | 39.72 | 397 | 23° 24’ 21.64’’N 87° 08’ 06.52’’E | 101.69 |
| 335 | 23° 24’ 43.67’’N 87° 08’ 32.64’’E | 71.398 | 398 | 23° 24’ 17.59’’N 87° 08’ 07.65’’E | 58.54 |
| 336 | 23° 24’ 35.46’’N 87° 08’ 35.37’’E | 39.82 | 399 | 23° 24’ 16.98’’N 87° 08’ 03.49’’E | 37.45 |
| 337 | 23° 24’ 42.37’’N 87° 08’ 34.69’’E | 78.62 | 400 | 23° 24’ 15.98’’N 87° 08’ 05.41’’E | 34.35 |
| 338 | 23° 24’ 44.61’’N 87° 08’ 37.89’’E | 32.72 | 401 | 23° 24’ 24.65’’N 87° 07’ 58.49’’E | 48.15 |
| 339 | 23° 24’ 46.56’’N 87° 08’ 38.45’’E | 42.757 | 402 | 23° 24’ 22.19’’N 87° 07’ 59.64’’E | 48.41 |
| 340 | 23° 24’ 46.39’’N 87° 08’ 37.64’’E | 48.905 | 403 | 23° 24’ 26.49’’N 87° 07’ 58.78’’E | 55 |
| 341 | 23° 24’ 44.26’’N 87° 08’ 39.64’’E | 34.36 | 404 | 23° 24’ 24.05’’N 87° 07’ 56.49’’E | 93.54 |
| 342 | 23° 24’ 45.69’’N 87° 08’ 46.59’’E | 42.21 | 405 | 23° 24’ 22.69’’N 87° 07’ 56.42’’E | 91.95 |
| 343 | 23° 24’ 45.26’’N 87° 08’ 46.26’’E | 41.94 | 406 | 23° 24’ 20.95’’N 87° 07’ 55.28’’E | 92.25 |
| 344 | 23° 24’ 49.67’’N 87° 08’ 59.62’’E | 94 | 407 | 23° 24’ 19.45’’N 87° 07’ 54.08’’E | 92.99 |
| 345 | 23° 24’ 49.45’’N 87° 08’ 56.27’’E | 93 | 408 | 23° 24’ 21.35’’N 87° 07’ 54.62’’E | 114.65 |
| 346 | 23° 24’ 48.58’’N 87° 08’ 58.24’’E | 95 | 409 | 23° 24’ 21.69’’N 87° 07’ 54.04’’E | 114.7 |
| 347 | 23° 24’ 42.36’’N 87° 09’ 26.08’’E | 89 | 410 | 23° 24’ 20.16’’N 87° 07’ 51.96’’E | 118.38 |
| 348 | 23° 24’ 43.64’’N 87° 09’ 27.64’’E | 87 | 411 | 23° 24’ 22.45’’N 87° 07’ 51.68’’E | 136.96 |
| 349 | 23° 24’ 40.36’’N 87° 09’ 29.52’’E | 89 | 412 | 23° 24’ 19.67’’N 87° 07’ 51.68’’E | 116.56 |
| 350 | 23° 24’ 39.68’’N 87° 09’ 29.89’’E | 90 | 413 | 23° 24’ 22.65’’N 87° 07’ 52.16’’E | 136.57 |
| 351 | 23° 24’ 41.65’’N 87° 09’ 26.95’’E | 90 | 414 | 23° 24’ 24.27’’N 87° 07’ 55.68’’E | 108.75 |
| 352 | 23° 24’ 41.67’’N 87° 09’ 25.95’’E | 91 | 415 | 23° 24’ 26.48’’N 87° 07’ 54.58’’E | 107.65 |
| 353 | 23° 24’ 38.68’’N 87° 09’ 28.94’’E | 91 | 416 | 23° 24’ 27.58’’N 87° 07’ 53.67’’E | 107.07 |
| 354 | 23° 24’ 39.67’’N 87° 09’ 27.94’’E | 91 | 417 | 23° 24’ 29.68’’N 87° 07’ 57.96’’E | 63.5 |
| 355 | 23° 24’ 40.24’’N 87° 09’ 27.95’’E | 90 | 418 | 23° 24’ 28.54’’N 87° 07’ 51.63’’E | 98.48 |
| 356 | 23° 24’ 41.58’’N 87° 09’ 28.67’’E | 89 | 419 | 23° 24’ 04.36’’N 87° 07’ 38.96’’E | -22.48 |
| 357 | 23° 24’ 42.36’’N 87° 09’ 28.64’’E | 88 | 420 | 23° 24’ 11.28’’N 87° 07’ 28.65’’E | 74.31 |
| 358 | 23° 24’ 41.36’’N 87° 09’ 30.67’’E | 88 | 421 | 23° 24’ 12.67’’N 87° 07’ 31.68’’E | 67.31 |
| 359 | 23° 24’ 42.64’’N 87° 09’ 27.25’’E | 88 | 422 | 23° 24’ 09.62’’N 87° 07’ 28.09’’E | 44.72 |
| 360 | 23° 24’ 43.64’’N 87° 09’ 29.36’’E | 87 | 423 | 23° 24’ 09.38’’N 87° 07’ 28.36’’E | 44.44 |
| 361 | 23° 24’ 41.34’’N 87° 09’ 30.67’’E | 87 | 424 | 23° 24’ 09.52’’N 87° 07’ 41.79’’E | -11.91 |
| 425 | 23° 24’ 23.49’’N 87° 06’ 54.04’’E | 149.38 | 435 | 23° 24’ 13.48’’N 87° 06’ 54.04’’E | 177.78 |
| 426 | 23° 24’ 57.63’’N 87° 08’ 42.19’’E | 78.22 | 436 | 23° 24’ 16.18’’N 87° 06’ 53.48’’E | 143.32 |
| 427 | 23° 25’ 01.49’’N 87° 08’ 19.46’’E | 115.1 | 437 | 23° 24’ 15.49’’N 87° 06’ 56.18’’E | 177.82 |
| 428 | 23° 25’ 03.46’’N 87° 08’ 23.49’’E | 89.38 | 438 | 23° 24’ 16.20’’N 87° 06’ 57.36’’E | 178.37 |
| 429 | 23° 24’ 23.49’’N 87° 08’ 01.45’’E | 102.96 | 439 | 23° 24’ 17.24’’N 87° 07’ 59.43’’E | 164.44 |
| 430 | 23° 24’ 21.69’’N 87° 08’ 04.12’’E | 0 | 440 | 23° 25’ 06.36’’N 87° 07’ 16.39’’E | 96 |
| 431 | 23° 24’ 20.12’’N 87° 07’ 59.45’’E | 52.86 | 441 | 23° 24’ 56.34’’N 87° 07’ 16.38’’E | 96 |
| 432 | 23° 24’ 21.69’’N 87° 07’ 58.59’’E | 52.86 | 442 | 23° 25’ 04.63’’N 87° 07’ 28.16’’E | 96 |
| 433 | 23° 24’ 13.45’’N 87° 07’ 32.18’’E | 29 | 444 | 23° 24’ 59.34’’N 87° 07’ 36.75’’E | 108.5 |
| 434 | 23° 24’ 33.28’’N 87° 07’ 08.29’’E | 167.41 | 445 | 23° 25’ 01.63’’N 87° 07’ 36.04’’E | 110.39 |