Engineering criteria for Ashtian city waste burial

Hosseinnejad M.R, Ghdimi F., Khoshkish H.
nejad@iustarak.ac.ir, ghadimi@iustarak.ac.ir khoshkish@iustarak.ac.ir
Iran University of Science and Technology Arak- Iran

Abstract

Four regions have been identified for evaluation as the waste burial site of the Ashtian city. Six groups of factors affecting the burial place were also selected. These groups include climate, hydrology, hydrogeology, geology, soil composition and general and technical condition. 32 different variables are involved in selection procedure. A numeric weight has been given to each variable based on two points of views. First each parameter should be a positive factor in increasing the ability of proposed site. Secondly, this parameter can act as a negative factor producing difficulties and limitations on the site selection. Five different grades are also used to give weight to each parameter. These include, very low, low, average, high and very high grades.

Using these six groups and 32 variables, a form has been designed to evaluate four different suggestions. Results are given to show the best suggestion.

Introduction

Humans have always produced waste. Ancient cities could be found by the large mounds that marked their sites. The inhabitants of these cities simply dropped their waste and built on top of it. The discarded shells formed large mounds that can still be seen in some places such as Ashtian city in center of Iran. This method of disposing of waste, results in the creation of midden heaps. This approach has serious public health consequences. Literally living in one's own waste leads to exposure to all of the disease organisms contained therein. Due to request from municipal of Ashtian city regarding to these problems attempts to creating a suitable place considering. The city suggested three new areas from engineering criteria city waste burial point view to be reviewed. Therefore Iran University of Science and Technology in Arak branch with regard to primary study of suggested areas and a technical design took the task of engineering senatorial waste burial in hand.

Methodology

Regarding the evaluation of selecting a suitable place for disposal waste burial throughout the city of Ashtian, four regions have been identified for evaluation as the waste burial site of the Ashtian city. Six groups of factors affecting the burial place were also selected. These groups include climate, hydrology, hydrogeology, geology, soil composition and general and technical conditions. 32 different variables are involved in selection procedure. Whit using these six groups and 32 variables, a form has been designed to evaluate four different suggestions, see table 3 in appendix *I*. A numeric weight has been given to each variable based on two points of views. First each parameter should be a positive factor in increasing the ability of proposed site. Secondly, this parameter can act as a negative factor producing difficulties and limitations on the site selection. Five different grades are also used to give weight to each parameter. These include, very low, low, average, high and very high grades as illustrated in Tables 1 and 2.

Table 1 The ability of waste burial Classification

The range of ability score	Class description	Class
1 to 32	Very Low	1
33 to 64	Low	2
65 to 96	Medium	3
97 to 128	High	4
129 to 160	Very high	5

Table 2 The limitation of waste burial Classification

The range of limitation score	Class description	Class
-1 to -32	Very Low	1
-33 to-64	Low	2
-65 to- 96	Medium	3
-97 to -128	High	4
-129 to -160	Very high	5

Therefore, we analyzed four areas of Ashtian city with concerned to six factors and 32variables. This research denoted, area A with 71 positive score has the first order, area B with 57 the second order, area C with 54 the third order and area D with 46 scores the fourth. It is obvious that the best condition has 160 scores. Therefore Area A with its relative 71 scores has a medium condition for burring of waste and can be declared the best.

Table 3 shown determining the priority of waste burial area

Suggested Area / Scores	Area **A**	Area **B**	Area **C**	Existent Area
Total of positive Scores	71	57	54	46
Total of negative Scores	-19	-22	-28	-33
Total of effects	52	35	26	13
Priority of waste burial	First	Second	Third	fourth

Engineering sanitary burial system

Landfill technology is used as the primary means for disposing of solid waste here because land is relatively cheap. The landfill is lined with an impervious material to prevent leachate from escaping. Once full, it is capped or covered, with an impervious material to prevent the introduction of rainwater that would increase the volume of leachate and breach the liner. The chief characteristic of a sanitary landfill is that waste is covered by a layer of dirt to keep out vermin. In general and structural wise 3 method of waste burial are considerate as fallow.

- Area method
- Excavated cell / Trench method
- Canyon / Depression method

With considering the situation of the area A from topography and water drainage point of view the Excavated cell / Trench and Canyon / Depression methods together are the best choice. In this area enough soil coverage, the ability of dig ditch, the depth of bed confining and water table, and finally impermeability of bed rock was reviewed and the conditions for such purpose are substantial.

The facilities designed for area A embedded in topography map are as:

1 Control System and Building with Bascule
2 Leachate Collection
3 Gas Collection
4 Parking and repair shop for machinery
5 Waste burner equipment and related buildings
6 Access road in the area
7 Diversion surface water canal
8 Weir
9 Covering vegetable soil
10 Liner, Daily &final cover
11 Tank for Water
12 Fencing

Conclusion

This research denoted in order to choosing the best area for waste disposal burying for Ashtian city, area A with 71 positive score has the first order, area B with 57 the second order, area C with 54 the third order and area D with 46 scores the fourth.

With consideration of each score the acceptable technology used for waste disposal in Ashtian city is incineration on the sanitary landfill; the modern lined and capped landfill. It does not require much far from city and is therefore the principal means of solid waste disposal in Ashtian, where transportation is relatively costly.

References

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Appendix *I*

Designed Form for evaluation of disposal waste burial in areas (**A, B,C** and **D**)

Factors	Parameters	Effect									
		Abilities					Difficulty and Limitation				
		Very high	High	Medium	Low	Very Low	Very Low	Low	Medium	High	Very high
		5	4	3	2	1	-1	-2	-3	-4	-5
Climate	Precipitation			#							
	Humidity			#							
	Temperature				#						
	Frost				#						
	Evaporation				#						
	Wind							#			
Hydrology	Density of drainage								#		
	Distance to river								#		
	Flood							#			
	Water surface quality							#			
	Distance to water resource			#							
Hydrogeology	bed confining depths				#						
	water table depths		#								
	Hydrodynamic coefficients			#							
	Under ground water usage						#				
Geology	Earthquake			#							
	Fault ,Joint and Fracture						#				
	Topography& Geomorphology			#							
	Erosion							#			
Soil	Soil composition			#							
	Permeability			#							
	Compressibility			#							
	Soil moisture			#							
	Surface soil contamination				#						
	The ability of dig ditch			#							
General and Technical Condition	Area			#							
	Enclosure		#								
	Land Preparation							#			
	Land Owner	#									
	Land use						#				
	Distance to region residential			#							
	Access Road	#		#							
Total Score of classes		5	20	42	4	0	-3	-10	-6	0	0
Total Score of effects		71					-19				
Total Results		52									