CITIZEN PERSPECTIVE ON SITING SOLID WASTE FACILITIES

Presented to the Maryland Solid Waste Task Force

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INTRODUCTION

Landfills, transfer stations, material recovery operations, and other solid waste facilities are vitally important to society. However, when improperly sited, designed, or managed solid waste facilities can cause severe harm to area residents and businesses. The purpose of this paper is to provide the citizen perspective on criteria to gain the benefits of solid waste facilities with fewer negative impacts upon Maryland residents.

HOW SOLID WASTE FACILITIES MAY HARM AREA RESIDENTS

The negative impacts reported by those living or working in the vicinity of solid waste facilities are:

- increased truck traffic which increases noise, safety concerns, and may cause vibration damage to structures,
- concerns about the quality of well water and other aquatic resources,
- release of noxious odors, smoke, or dust,
- pest infestations, and
- loss of property value.

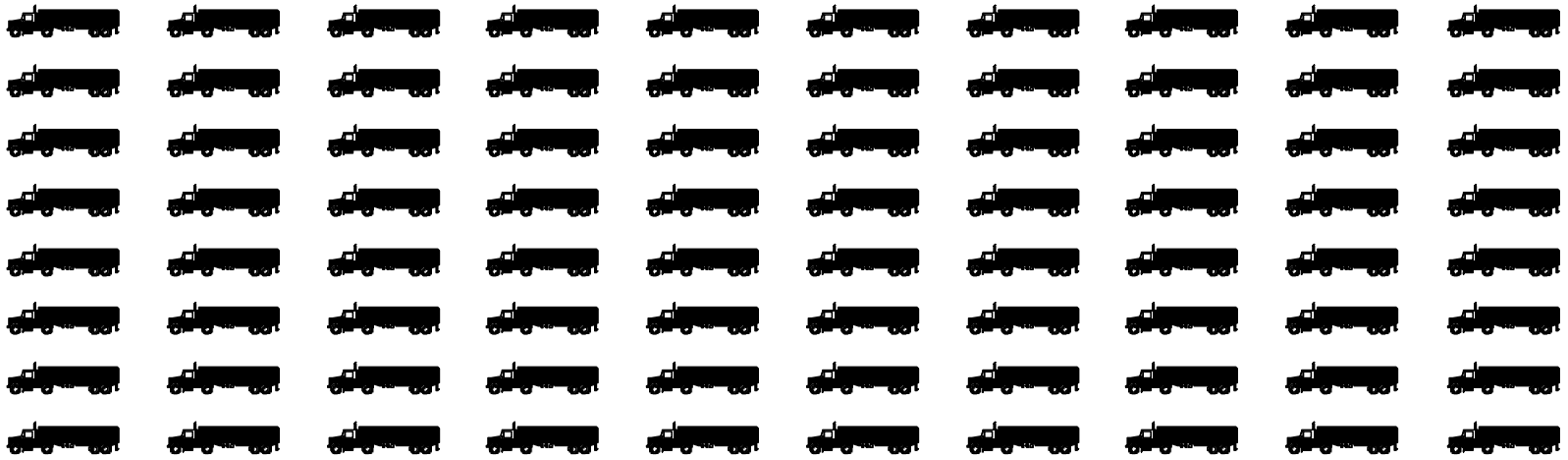
Each of these impacts has occurred at one or more solid waste facilities in Maryland. Following is further detail on the citizen perspective regarding each impact.

Truck Traffic

As shown in the figure following this page, a typical rural road might carry 20 truck trips per day. Locating a solid waste facility along the road will increase truck traffic by 100 to 200 trips per day and may go as high as 800 truck trips per day. The increased truck traffic associated with solid waste facilities has caused a sense of diminished safety among those traveling the affected roads. Following are some of the specific safety issues identified at existing facilities within Maryland:

- A number of incidents have occurred in which trucks transporting waste have overturned, spilling contents onto a road and tying up traffic;
- At some facilities trucks will queue near the entrance in the early morning hours while waiting for the landfill to open. If adequate off-road parking is not available, then traffic flow is impeded;
- High-speed truck operation, tail-gating, and crossing of centerlines all impart a sense of a threatening situation among other motorists sharing a road with a high volume of truck traffic;

Rubble Landfills & Truck Traffic

TRUCK TRAFFIC ON A TYPICAL LOCAL ROAD **20 TRIPS/DAY**	
TRUCK TRAFFIC WITH A RUBBLE FILL **200 TRIPS/DAY**	
MAXIMUM RUBBLE FILL TRUCK TRAFFIC **800 TRIPS/DAY**	

One  **= 10 Truck Trips/Day**

- At a land-clearing debris landfill in southwest Baltimore County a school bus and a mail carrier were reportedly forced off the road by trucks. A dump truck crashed through a house located near the road.

Noise and vibration has also been a concern for those living along affected roads. These issues are particularly acute when a facility is established along a narrow or winding rural road or a residential street.

An increase in truck traffic can lower the value of homes located near the affected roads. The loss of value results from increased noise. A study of the impact of traffic noise documented an average of a 0.4% decrease in property value for each decibel increase above 55dBA.[1] At 50 feet a heavy truck produces 90 dBA which would yield a 14% decline in property value. Heavy trucks may have an effect on property value which is 150 times greater than that caused by an equivalent increase in passenger car traffic.

Quality of Well Water & Other Aquatic Resources

There is a great deal of concern about the potential impact of a landfill upon water quality. And there is good cause for this concern. Table 1 and 2, following this page, show that metals and other contaminants in rubblefill leachate exceed water quality criteria by up to 500 fold. Concern is particularly high among those who rely upon wells located in the vicinity of landfills. Though this concern has declined somewhat where liners and leachate collection systems are required, it has not been completely dispelled. Nearby residents worry about the long term effectiveness of a liner-leachate collection system in preventing the release of contaminants into ground and surface water.

Odors, Smoke & Dust

Significant odor problems have occurred at a number of landfills in Maryland. In the early 1990s a severe odor problem developed at the Sandy Hill municipal waste landfill in Prince George's County. The problem began when landfilled waste was excavated to install a liner-leachate collection system. The problem persisted for months. During this period area residents were forced to seal their homes. The impact was particularly severe for low-income residents who could not afford to air-condition their homes during the summer.

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[1] Residential noise damage costs caused by motor vehicles, *Transportation Research Record* 1559:84-95.

Table 1: Maximum Concentration of Metals Detected at Rubble Landfills

Rubble Landfills Investigated		Maximum Concentration of Contaminant (milligrams per liter)									
Location	Number of Facilities	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Wisconsin [1]	2	<0.01		0.012	0.010	0.003	<0.00003				0.200
Ohio [2]	4	0.330	<0.001		0.026	0.020	0.0004	0.130	<0.005		0.173
New York [3]	20	0.016	0.018	0.086	0.90.	3.586	0.003	0.078		0.006	4.456
Washington Co., MD [4]	1		0.005	0.023	0.130	0.053	0.0003		<0.005	0.023	0.320
Aquatic Life Protection Criteria [5]		0.360	0.0039		0.018	0.082	0.0024	1.40	0.020	0.0041	0.120
Highest Value ÷ Criteria		0.9	8		50	44	4	0.1	0.1	7	72

1. *Investigation of groundwater impacts at construction and demolition waste landfills*, presented at the 17th International Madison Waste Conference, September 21-22, 1994, Department of Engineering Professional Development, University of Wisconsin-Madison.
2. Data was provided in a letter from Ms. Annette DeHavilland, Ohio Division of Solid & Infectious Waste, to Richard Klein, of Community & Environmental Defense Services.
3. *Data Evaluation: Construction and Demolition Debris*, New York Department of Environmental Conservation, Division of Environmental Enforcement, 50 Wolf Road, Albany, NY 12233-5500. Two of the 20 C&D landfill included in this study were included in the USEPA report *Construction and Demolition Waste Landfills*, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D.C. 20460.
4. Based upon data enclosed with two letters 1) a letter dated August 31, 1999, from C. Steve Zies, Washington County Solid Waste Department (301-791-3101), to Richard Klein, of Community & Environmental Defense Services, and 2) a letter dated December 26, 1996, from Richard W. Collins, Director - Waste Management Administration, Maryland Department of the Environment, 2500 Broening Highway, Baltimore, MD 21224, 410-631-3304.
5. Acute freshwater criteria as set forth at COMAR 26.08.02.03-2G.

Table 2: Maximum Concentration (in micrograms per liter) of Pollutants Documented by the U.S. Environmental Protection Agency in Leachate from Rubble Landfills [1]

Water Quality Parameter	Concentration	Drinking Water Standard [2]	Aquatic Life Protection Standard [3]	Concentration Divided By Lowest Standard	Percent of Landfills Pollutant Was Detected At
CONVENTIONAL PARAMETERS					
Ammonia	480,000		29,000 [4]	??	100%
Nitrate [5]	13,000	10,000		1.3	71%
Biochemical Oxygen Demand (5	320,000				93%
Chlorides	2,400,000	250,000		10	100%
Fluoride	5,000	2,000		3	66%
Manganese	258,000	50		5,160	100%
Oil & Grease	50,000				86%
Total Phenolics	4,900				75%
Sulfates	2,700,000	250,000		11	88%
INORGANICS					
Aluminum	6,350	50-200		32-127	100%
Arsenic	120	50		2	75%
Barium	8,000	2,000		4	100%
Beryllium	2.1	4.0		0.5	20%
Cadmium	2,050	5	3.9	526	74%
Chromium	250	100		3	56%
Hexavalent chromium [6]	4,920		16	308	20%
Copper	620	1,000	18	34	78%
Cyanide	340	200	22	15	75%
Iron	172,000	300		573	100%
Lead	2,130	15	82	142	72%
Mercury	9.0	2.0	2.4	5	27%
Nickel	170	100	1,400	2	58%
Selenium	5	50	20		7%
Silver	30	100	4.1	7	17%
Vanadium	96	200			25%
Zinc	8,630	5,000	120	72	100%

1. The data contained in this table was presented in *Construction and Demolition Waste Landfills*, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D.C. 20460.
2. Maximum contaminant level or secondary MCL
3. Acute freshwater criteria from the Code of Maryland Regulations (COMAR) 26.08.02.03-2G.
4. U.S. EPA freshwater ammonia criteria assuming a pH of 6.5 and a water temperature of 25EC.
5. Ammonia is converted into nitrate as it enters oxygenated waters. Thus the actual nitrate concentration is closer to the value for ammonia presented above.
6. Hexavalent chromium levels are much higher than total chromium because of variances between landfills in the frequency of analysis for these two parameters.

Table 2: Continued - Organics

Pollutant	Concentration	Drinking Water Standard	Aquatic Life Protection Standard [1]	Concentration Divided By Lowest Standard	Percent of Landfills Pollutant Was Detected At
Total Organic Halogens	910				100%
Acetone	5,100	4,000		1.3	66%
Acenaphthene	3	2,000			14%
alpha-BHC	0.12	0.006		20.0	17%
Benzene	2.70	5.00			22%
Chloroethane	353				22%
Chloroform	3	100			11%
Chloromethane	43				22%
1,2-Dichloroethane	26	5		5.2	33%
1,1-Dichloroethane	6.2	4,000			33%
1,1-Dichloroethene	3	7			11%
trans-1,2-Dichloroethene	4	100			25%
Dieldrin	0.065	0.002	2.5000	32.5	17%
Diethyl phthalate	16	30,000			14%
Disulfoton	0.96	1			33%
Di-n-butyl phthalata	16	4,000			25%
Ethylbenzene	18	700			56%
2-Hexanone (methyl butyl ketone)	4.8				20%
Methyl ethyl ketone	2,500	20,000			33%
Methylene chloride	60	5		12.0	33%
2-Methylphenol (o-cresol)	130				29%
4-Methyl-2-pentanone	250				33%
4-Methylphenol (p-cresol)	5,700				80%
Naphthalene	63	1,000			29%
Phenol	2,990	20,000			63%
Styrene	1.1	100			20%
Tetrachloroethene	4.8	5			11%
Toluene	240	1,000			44%
Trichloroethene	20	5			33%
Trichlorofluoromethane	20	10,000			40%
2,4,5-T, 2,4,5-Trichlorophenoxyacetic	0.53	50			50%
Xylene (total)	85	10,000			50%

1. The absence of aquatic life protection standards for many of the organics does not indicate that these substances are non-toxic. For many of these compounds there simply isn't sufficient information to establish criteria for the protection of aquatic life.

The odor of hydrogen sulfide has been a problem at several Maryland rubble landfills. This gas has the aroma of rotten-eggs. The gas forms when gypsum wallboard decomposes in a wet, organically-rich environment. Hydrogen sulfide releases from rubble fill have been detectable up to three miles away and have caused nearby residents to suffer nausea and severe headaches.[2] According to the U.S. Public Health Service[3] the clinical effects of hydrogen sulfide are:

- At 0.1 part per million (ppm) of hydrogen sulfide (H_2S) is detectable as an unpleasant, rotten-egg odor.

- At 250 ppm H_2S causes irritation of mucous membranes, bronchitis and pulmonary edema.

- At 500 ppm symptoms include headache, nausea, weakness, disorientation and coma.

- Exposure to concentrations greater than 500 ppm results in severe toxicity and death. Respiratory paralysis and death may be noted within 30 to 60 minutes.

- Other health effects include respiratory depression, tremors, blurred vision, cyanosis, convulsions, and tachycardia.

Hydrogen sulfide levels as high as 5,000 ppm have been detected above a landfill containing large amounts of gypsum wallboard.[4] Those who live near two existing Maryland rubble landfills commonly reported smelling hydrogen sulfide three miles away. The nearest residents would frequently suffer severe headaches and nausea.[5] Therefore it is reasonable to assume that the H_2S concentration may have been at or near 500 ppm. A slight increase may have lead to far more severe health effects.

At two Maryland rubble landfills, Al-Ray and Brandywine Enterprises, nearby residents have reported several impacts upon quality of life due to the combined effects of hydrogen sulfide

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[2] To contact people who live near both facilities who can attest to the hydrogen sulfide problem, contact Richard Klein, of Community & Environmental Defense Services, at (410) 329-8194.

[3] Based upon a letter dated August 25, 1993, from Dr. Hugh J. Hansen, U.S. Public Health Service, to Richard Klein, of Community & Environmental Defense Services.

[4] This statement is based upon measurements made at the Coquitlam municipal landfill near Vancouver, British Columbia.

[5] Affadavits regarding the hydrogen sulfide effects on those living near rubble landfills are available from Community & Environmental Defense Services.

and dust. Some years the problem was so severe that residents were forced to keep their windows closed all summer long. They could not hang wash outside or host cook-outs in their backyard.

In the early 1990s the Jett land clearing debris landfill in southwest Baltimore County caught fire. The fire persisted for months and could frequently be smelled by commuters on the Baltimore beltway six miles to the east. Thus the smoke affected the quality of life for thousands of area residents.

Pest Infestations

Cockroach infestation were a problem at the Oak Avenue rubble landfill in Harford County and the Jett land clearing debris landfill. The Oak Avenue infestation affected approximately 100 nearby homes.

Loss of Property Value

Several researchers have examined the direct effects of solid waste facilities upon property value.

Two Canadian researchers reviewed ten studies of the effects of landfills and incinerators upon property value.[6] The authors found a significant decline in property value in half of the studies and no significant effect in the other five investigations In the review the authors also presented the results from an 11th study they conducted. This additional study showed no significant adverse impact on property value due to a landfill and an incinerator.

The Canadian researchers concluded that the 11 studies showed that the effect of solid waste facilities on property values is neither consistent nor predictable. They speculated that the lack of significant effects noted in six of the 11 studies may have been due to three factors: 1) that buyers were either not aware of potential facility impacts or did not understand the potential impacts, 2) real estate agents or sellers may have screened prospective buyers for sensitivity to facility impacts, and 3) the other amenities common to the vicinity of waste facilities, such as close proximity to urban areas, may have countered facility effects on property value.

Unfortunately it is not clear from the 11-study review just how obvious the solid waste facilities were from the subject properties. But this information was provided in a study of a San Fernando valley landfill.[7] This study found no adverse effects upon the value of nearby homes. The authors of the San Fernando study concluded that this was due to three principle factors. First, the homes were separated from view of the landfill by a hill. Second, the access to the landfill was via a road which did not pass by the homes. Third, the landfill was well-managed which minimized problems with odors, blowing debris, sea gulls, and other nuisance factors.

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[6] Waste facility impacts on residential property values, *Journal of urban planning and development* 115(2):64-80.

[7] An evaluation of the impact of a well-designed landfill on surrounding property values, *The Appraisal Journal* April 1991, pp. 247-252.

BLR Real Estate Appraisal[8] studied the effect of two Maryland landfills upon property value. In a study of the value of a property located near the Scarsboro municipal landfill, in Harford County, the appraisal study documented that contamination of the well serving the property lowered the value by 90%. A study of the effect of a Prince George's County rubble landfill showed that the value of homes within one mile was lowered by 10%.

GETTING THE BENEFITS OF SOLID WASTE FACILITIES WITH FEWER NEGATIVE IMPACTS

If a solid waste facility is designed so that it cannot be seen, heard, or smelled from area homes and truck traffic does not pass by homes, then it will have minimal impact. This concept was included in the *1992 Maryland Solid Waste Accord*. Item #3 in the Accord called for siting criteria that resulted in facilities which area residents *"Can't See, Hear or Smell."*

Table 1 provides a comparison of the siting requirements adopted by Maryland's 23 counties and Baltimore City. The table is based upon the survey conducted by the Waste Management Administration of the Maryland Department of the Environment which was previously distributed to the Solid Waste Task Force. The requirements selected for use in Table 1 were those most relevant to the impact of solid waste facilities upon area residents.

Table 1 shows wide variation in the requirements adopted by the 23 counties and Baltimore City. While one might assume that local discretionary powers permits a county or city to adjust requirements as needed, the next section of this paper shows why this assumption is not correct.

Local Limits on Regulating Facility Impacts

As shown in Table 1, a number of jurisdictions permit landfills by Special Exception or Conditional Use Permit. Under Maryland law a use permitted by Special Exception or a a Conditional Use is generally considered to be compatible with other uses permitted in the same zoning classification. In fact, the courts have ruled that a Special Exception or Conditional Use can only be denied when *"extraordinary impact"* will result

Under the extraordinary impact test a local jurisdiction is obligated to approve a Special Exception or Conditional Use Permit unless it is found that the impact of the landfill is substantially greater than on any similarly zoned tract of land in the county or city. For example, let's say a local Board of Appeals finds that a landfill will cause substantial traffic impacts and these impacts cannot be designed away. The Board must still approve the landfill unless it is

[8] BLR Real Estate Appraisal, 2316 Franklin's Chase Court, Fallston, Maryland 21047, (410) 557-9787.

Table 3: Summary of "County Zoning Requirements & Other Local Approvals Required for the Siting & Operation of Solid Waste Management Facilities" Prepared by the Maryland Department of the Environment

County/City	BUFFER (feet)		Height Limitation	PERMITTED ON LAND ZONED (By Right; Special Exception (SE) or Conditional Use Permit (CU)				Rubble Fills Prohibited on Local Roads
	From Nearest Home	From Property Line		Industrial Manufacturing	Commercial	Residential	Rural Agricultural	
Allegany		500	30 feet	By Right			By SE/CU	
Anne Arundel	1,000		2,500-ft [1]	By SE/CU			By SE/CU	YES
Baltimore City				Case-By-Case	Case-By-Case			
Baltimore Co.		100-300		By SE/CU	By SE/CU		By Right/SE/CU	
Calvert		500		By SE/CU			By SE/CU	
Caroline		100		By SE/CU	By SE/CU		By SE/CU	
Carroll				By Right				
Cecil		100	2,500-ft [1]	Only on County-owned land				
Charles				By SE/CU			By SE/CU	
Dorchester						By SE/CU	By SE/CU	
Frederick				By Right/SE/CU			By Right/SE/CU	
Garrett				By SE/CU	By SE/CU	By SE/CU	By SE/CU	
Harford	1,000	200	2,500-ft [1]					
Howard		300		By Right			By Right	
Kent							By SE/CU	
Montgomery				By SE/CU				
Prince George's				By SE/CU		?	By SE/CU	
Queen Anne's *Pre-1996*	70		none	By SE/CU			By SE/CU	NO
1996 Amendments	1,000		45	By SE/CU			By SE/CU	YES
Bill 99-04		100	none	By SE/CU			By SE/CU	NO
Saint Mary's							By SE/CU	
Somerset				By SE/CU	By SE/CU		By SE/CU	
Talbot	300	100		If Council OKs	If Council OKs	If Council OKs	If Council OKs	
Washington		400					By SE/CU	
Wicomico				By SE/CU	By SE/CU			
Worcester		100		By SE/CU			By SE/CU	

1. Landfill may not be higher than tallest structure or natural feature within 2,500 feet.

proven that the site is the worst location in the county or city from a traffic stand-point. The extraordinary impact test prevents local governments from fully addressing citizen concerns about a proposed facility.

Landfills & Other Solid Waste Facilities Should Be Guided To Industrially Zoned Sites
As shown in Table 1, solid waste facilities are permitted by Special Exception or Conditional Use Permit on lands zoned rural, agricultural, and, in some cases, residential. Landfills are more akin to and compatible with industrial activities. They are fundamentally incompatible with residential areas. Given the one- to three-acre lot size permitted in many agriculturally zoned areas of Maryland, a landfill can be just as incompatible with properties zoned for rural-farming uses.

Landfills should be prohibited in residential and rural-agricultural zones. These facilities should only be permitted on properties zoned for industrial or manufacturing uses. It is more likely that the criteria applied to industrially zoned land will minimize the adverse effects upon residential areas. But, in addition to restricting landfills to industrially-zoned land, the following minimum criteria should be adopted by all jurisdictions, or by amending State law. These criteria will establish a base set of requirements that will result in waste facilities that cannot be seen, heard, or smelled.

Truck Traffic: Solid waste facilities should located so that access is off of a state primary road or a larger highway. A state primary road has a lane width of 12 feet and 8-foot shoulders. Approximately a fourth of all roads in Maryland meet or exceed this classification. Facilities should never be sited on local roads or residential streets.

Landfill Buffer: A minimum buffer of 1,000 feet must be maintained between the area where waste is landfilled or processed and the nearest home, school, church, or other institutional buildings. Sites should be selected where the 1,000 foot buffer is in mature trees. When this is not possible, then the buffer should be landscaped or modified to achieve 100% screening of the landfill from area homes and roads..

Landfill Height: The maximum elevation of the landfill should not extend above the sight line of the trees or other features obscuring the facility from view from existing homes.

Minimize the Need for Disposal Facilities
It is imperative that we reduce the need for landfills and other disposal facilities by maximizing recycling, reuse, and waste minimization. We should raise the municipal waste recycling goal to 50% and establish a minimum recycling requirement for construction and demolition debris. Coupled with these requirements should be a process for evaluating the need for additional facilities.

Adoption of a More Open Facility Siting & Management Process
For the most part a closed process is used to site solid waste facilities in Maryland. We must open the process up to greater citizen involvement. Canadian experiments with an open process for hazardous waste facilities has resulted in greater success in siting new facilities.[9]

As shown in the flow chart following this page, currently citizen participation only occurs once a decision has been made about where to site a facility. Citizens may learn of a proposed landfill a few weeks or perhaps a month or two before their final opportunity to influence facility

[9] Canadian innovations in siting hazardous waste management facilities, *Environmental Management* 22(4):533-545.

location, design, and operation. This sets up an adversarial environment in which citizens have little choice but to seek to defeat the facility.

In the more open Canadian approach the initial emphasis is on educating the public about the need for solid waste facilities and the pros/cons of a community hosting a facility. This education begins ***before*** selecting candidate sites. Instead, communities are invited to become hosts. A referendum must be held in prospective host communities to ensure that majority supports exists. Only then does the process proceed into detailed evaluation of the suitability of prospective host communities. A community then has the option of dropping out at any time. Once a site selection decision is made the open process continues with full citizen participation in facility design, management, and closure.

Again, the Canadian experience has been that the open approach results in greater acceptance of hazardous waste facilities when compared to the traditional closed approach. Adopting this same open approach, or a modified version, would do much to reduce the extreme conflict produced by the current closed approach employed in most Maryland solid waste siting decisions.

CITIZEN PARTICIPATION OPPORTUNITIES
Solid Waste Facility Siting & Design

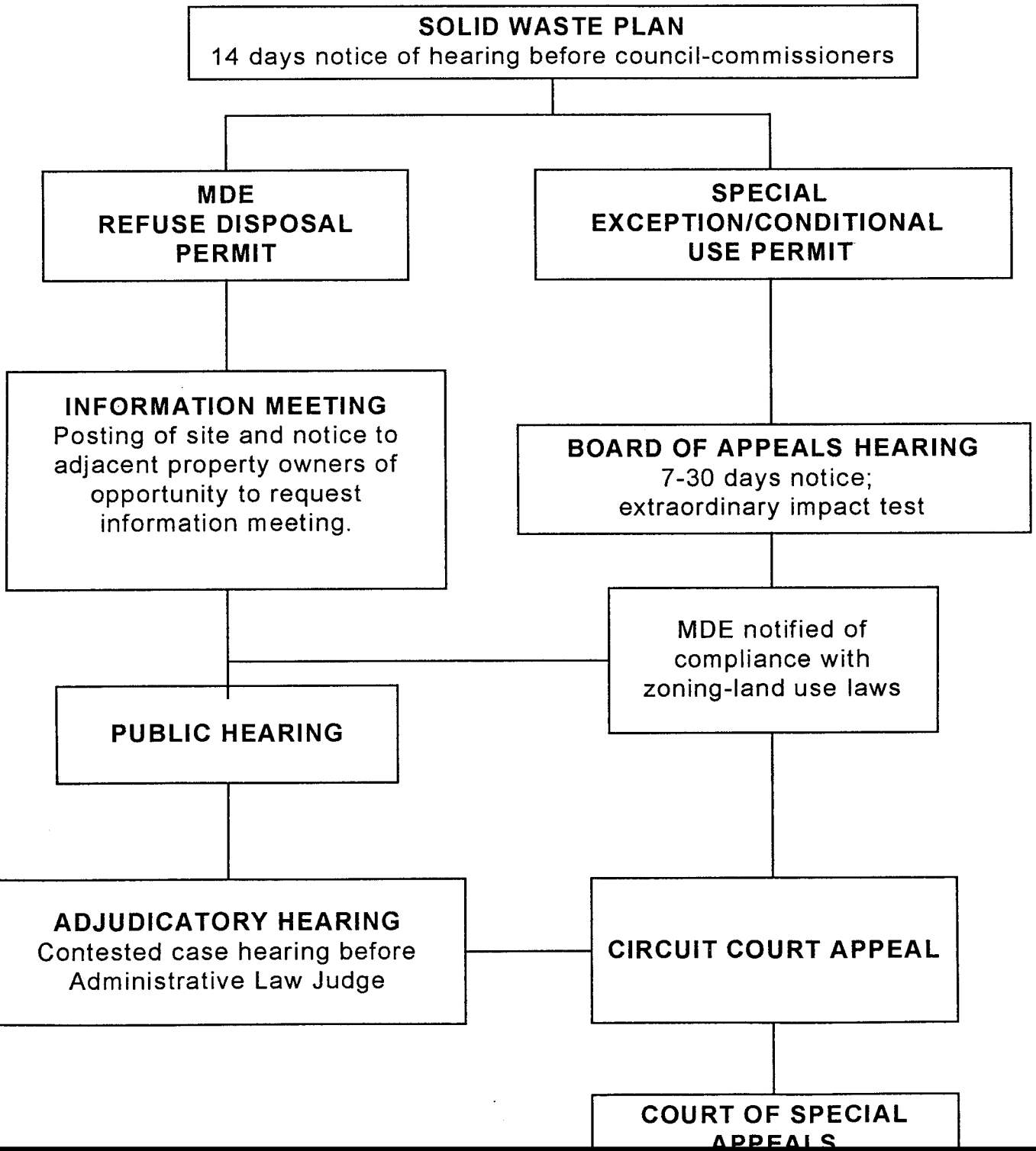

Table 2. Life cycle of siting process and staging of siting considerations

Siting considerations	Presiting consultation	Preliminary organization	Siting implementation	Postsiting liaison
Social	• Commit to full term public involvement program (from siting until facility closure). • Help public understand status quo is unacceptable. • Establish trust by discussing siting process in a broad geographical area.	• Open sharing of information that is publicly accessible. • Hold open houses that allow personal interaction (limit to 50 people)	• Joint government and private industry ownership. • Majority of community residents must accept the process.	• Citizen advisory group defines terms of acceptance. • Government regulates facility operations. • Community regulates facility operations. • Establish communication program.
Political	• Commit to shared decision-making power between government and community.	• Local councils invite siting committee into community	• Establish citizen advisory group in volunteer communities. • Local residents vote in referendum. • Community liaison group advises council.	• Negotiate acceptance agreement. • Government owns the land and future liability.
Environmental & Technical	• Define general environmental siting constraints. • No-preconceived ideal site. • Present generic information of technology (no detailed design).	• Collect public input on technical features. • Assure that environment and public health and safety are protected.	• Detailed design of the facility and technical components. • Demonstrate safety and effectiveness of facility technology.	• Incorporate environmental monitoring programs into facility operations.
Transportation	• Do not use transportation distance as an elimination criteria.	• Identify risks and possible transportation routes and modes.	• Focus on the communities interested in hosting the facility. • Identify and assess transportation scenarios.	• Establish emergency response plans. • Schedule shipments during low traffic periods.
Economic	• Provide mapping information useful for other purposes.	• Communities participate at no cost. • Facility must improve local economic diversity.	• Funding provided for communities to complete independent investigations.	• Preferential hiring of local residents. • Free hazardous waste treatment for host community.
Process	• Open discussions (nondefensive). • Independent siting committee facilitates siting (outside government influence). • Involve as many potential communities as possible.	• Voluntary participation • Ability to opt out of the process.	• Use open houses limited to 50 people. • Referendum held after at least 18 months have passed. • Follow political rules for voting procedures (maintain a fair and representative vote).	• Community representation on management & monitoring committees. • Public access to monitoring information.