

Alternative Daily Cover
Draft White Paper (for discussion only)
June 29, 2009

The California Integrated Waste Management Board (Board) directed staff to review CIWMB regulations to ensure they are grounded in the best available science, address changing market conditions, and take advantage of developing technologies. CIWMB staff developed priority regulatory areas for review as part of the [Strategic Directives](#) (SD) adopted by the Board in February 2007 and to support the [Organics Roadmap](#). One of the priority regulation areas the Board directed staff to review is alternative daily cover regulations.

Landfill operators must cover all disposed solid waste at the end of each day to control odors, vectors, fires, litter, and scavenging. Federal regulations require landfill operators to use six inches of earthen materials as daily cover; operators are also allowed to use alternative materials in lieu of earthen materials to cover waste at landfills. These materials are referred to as alternative daily cover (ADC). California regulations¹ also require all landfill operators to cover disposed solid waste with a minimum of six inches of compacted earthen material or alternative cover materials of alternative thickness at the end of each operating day. In addition, the use of waste-derived ADC at landfills in California is considered diversion through recycling and not disposal.²

Some stakeholders have indicated that ADC materials are used in excess of the limits contained in regulation. Overuse results in jurisdictions having less waste allocated to disposal when calculating diversion rates. Stakeholders have also indicated that material performance and environmental impacts of ADC have not been fully researched. In addition, some stakeholders in the compost and biomass industry indicate that the use of green material ADC negatively impacts the availability of compost/mulch feedstock. Other stakeholders indicate that the positive aspects of ADC must also be considered, such as conserving landfill capacity, providing an environmentally-beneficial alternative to impacts associated with traditional soil cover, and establishing a collection infrastructure and backup market for waste-derived materials with limited uses. Below are several issues identified by stakeholders based on recent informal contact:

1. The optimum amount, depth, and quality of Board-approved ADC have not been adequately researched
2. It may be difficult to evaluate ADC compliance, and misuse of ADC can go undetected
3. ADC often contains materials (food waste, wallboard) that are not allowed in regulation
4. The CIWMB's site-demonstration project requirements for new ADC materials lack guidance which makes it difficult to test new ADC types, such Material Recovery Facility and C&D fines
5. The definition of Green Material in the compostable materials handling regulations is different than the ADC definition of Processed Green Material
6. The CIWMB's Strategic Directive 6.1 aims to reduce the amount of organics in the waste stream by 50% by 2020. Green waste ADC is considered diversion through recycling and not disposal which is a disincentive to keep green material out of the waste stream.
7. Using organic materials to reduce greenhouse gas emissions at landfills is currently being researched
8. The Department of Toxic Substances Control is reexamining Auto Shredder Waste (ASW), and its Reclassification as a hazardous waste would disallow its use as ADC

This paper will provide a brief history of ADC regulations in California, ADC types and specifications, ADC in other states, current ADC use in California, organic materials processing infrastructure, and ADC regulatory issues identified by California stakeholders.

¹ Title 27 California Code of Regulations (CCR), Section 20680 . Section 20690 (a) describes general requirements of ADC and Section 20690 (b) provides specific requirements for the eleven approved ADC material types in California.

² Public Resources Code Section 41781.3 (a) The use of solid waste for beneficial reuse in the construction and operation of a solid waste landfill, **including use of alternative daily cover**, which reduces or eliminates the amount of solid waste being disposed pursuant to Section 40124, shall constitute diversion through recycling and shall not be considered disposal for the purposes of this division.

ADC Regulations History in California

Federal solid waste regulations require owners or operators at municipal solid waste landfills to cover disposed solid waste with six inches of earthen material at the end of the operating day to control odors, vectors, fires, litter, and scavenging.³ This requires either excavating soil at the landfill site or importing soil. Many landfills do not have adequate amounts of soil available on site and must import soil for daily cover which can have negative environmental impacts (burning fossil fuels during transportation, generation of greenhouse gases, increased traffic, etc.) 40 CFR 258.21 (b) allows states to approve alternative materials of an alternative thickness if landfill operators demonstrate that the alternative material and thickness will control odors, vectors, fires, litter, water infiltration, and scavenging. These alternative materials are referred to as alternative daily cover (ADC), and landfill operators in California have been using ADC since the early 1990's.

The following is a summary of the Board's actions in developing regulations associated with ADC:

- ... On May 17, 1990, the Board adopted "Procedural Guidance for the Evaluation of Alternative Cover" which allowed ADC use on a case-by-case basis.⁴ Operators performed site-specific demonstration projects to establish the suitability of one or more ADC materials as cover. LEA's monitored the demonstration projects for compliance with state minimum standards and cover performance standards. Operators submitted final reports at the conclusion of the demonstration projects, and the LEA, with assistance from Board staff, reviewed and approved the final reports to determine if the demonstration projects were successful.
- ... In December 1993, the Board adopted policy that allowed the use of waste-derived ADC to be considered diversion. The policy had 3 basic elements: (1) successful completion of a year-long demonstration project; (2) a limit on the amount of ADC allowable for disposal reduction to not exceed the amount of soil required for the daily cover in the facility permit; and (3) jurisdictions were limited to claiming 7% of their diversion rate from using ADC. In the first version of the Disposal Reporting Regulations, adopted at the end of 1994, ADC was not considered disposal, but the Office of Administrative Law (OAL) disapproved this portion of the regulations, claiming the statute allowed the Board to consider ADC as diversion or disposal, but not a combination of diversion and disposal. The Board then removed the 7% limit from the regulations which was approved by OAL in early 1995.⁵
- ... The Natural Resources Defense Council filed a lawsuit claiming that ADC use as diversion was not legal. This lawsuit was resolved with the passage of Assembly Bill 1647 (Bustamante, Chapter 978 of the Statutes of 1996) which stated that the use of waste-derived ADC constitutes diversion through recycling. AB 1647 required the Board to adopt regulations for the use of ADC considering: (1) conditions established in past policies on ADC; (2) conditions necessary to provide for the continued economic development, economic viability, and employment opportunities provided by the composting industry in the state; and (3) performance standards on limitations on maximum functional thickness necessary to ensure protection of public health and safety consistent with state minimum standards.⁶
- ... To comply with AB 1647, the Board adopted regulations at their July 23, 1997 meeting. On December 31, 1997 staff submitted the rulemaking file for the six subsections to OAL for approval. OAL

³ Title 40, of the Code of Federal Regulations (CFR), Part 258.21

⁴ February 11, 1997 Board Meeting, Agenda Item 15

⁵ March 18, 2008 Board Meeting, Agenda Item 7, Attachment 1

⁶ March 18, 2008 Board Meeting, Agenda Item 7, Attachment 1

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approved these regulations on February 3, 1998. These regulations (Section 20690 (b)) established all disposal site standards governing the use of ADC. These standards were based on previous Board policy and site-specific demonstration projects of ADC materials conducted by landfill operators between 1988 and 1995. The regulations require that any potential use of a new ADC material and listed ADC material used in a manner different from the standard be subject to a site-specific demonstration project approved by the LEA with concurrence at the CIWMB staff level. Use of listed ADC materials in accordance with the prescribed standards does not require a site-specific demonstration project but does require the LEA to review and approve a request to use ADC for each site.⁷

- ... A number of cases of ADC use inconsistent with regulations have been brought to the attention of the Board. In July 2001, the Board heard issues related to year 2000 ADC use. The reporting of ADC under the Disposal Reporting System showed an increase in green material ADC use.⁸ Board staff investigated nine facilities in 2001 and determined seven facilities misreported ADC use and two facilities had used ADC inconsistent with regulations by using more than the allowed thickness. Staff conducted another ADC investigation at nine landfills in 2002 and determined that some operators were mixing two or more ADC materials; layering two or more ADC materials; inadequately pre-processing ADC feedstock prior to use; stockpiling & reusing ADC; and inaccurately describing ADC use in the Report of Facility Information.⁹ CIWMB staff generally found there was inconsistent application of the requirements relative to the review and approval of ADC use and that many Reports of Disposal Site Information (RDSI) were not amended as required. The investigation findings were addressed (as verified by inspections), and Board staff worked with LEAs to ensure they were taking appropriate action to gain compliance with RDSI requirements.

- ... ADC regulations were revised in 2004. Major changes included: specifying pre-processing and grain size requirements for green material and C&D ADC; minimizing contamination of ADC with waste and other ADC materials; disallowing the blending or layering of different types of ADC without demonstration projects and EA approval; changing sludge and compost compaction thickness requirements; changing definitions of green material and C&D ADC; clarifying beneficial reuse of solid waste at landfills; and revising RDSI regulations and specifying ADC use in the RDSI's.

ADC Types and Specifications

There are eleven types of ADC described in regulation. Some are specifically manufactured (tarps/films, foam, and sprays), while other ADCs are waste-derived (ground green material, shredded tires, sludge, etc.) The following are the eleven ADC material types described in regulations (Title 27 CCR 20690 (b) (1-11))

- 1) Geosynthetic Fabric or Panel Products (Blankets)
- 2) Foam Products
- 3) Processed Green Material
- 4) Sludge and Sludge-Derived Materials
- 5) Ash and Cement Kiln Dust Materials
- 6) Treated Auto Shredder Waste
- 7) Contaminated Sediment, Dredge Spoils, Foundry Sands, Energy Resource Exploration and Production Wastes
- 8) Compost Materials
- 9) Processed Construction and Demolition Wastes and Materials (C&D)

⁷ March 18, 2008 Board Meeting, Agenda Item 7, Attachment 1

⁸ July 25-26, 2001 Board meeting, Agenda Item 24

⁹ December 10-11, 2002 Board Meeting, Agenda Item 28 and June 17-18, 2003 Board Meeting, Agenda Item 28

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10) Shredded Tires

11) Spray Applied Cementitious Products

Board regulations require specifications on ADC material application relative to depth. Exceeding the maximum depth is considered noncompliance and the material used in excess would be considered disposed. LEAs enforce thickness limits on individual ADC types to ensure compliance with the regulations. Foam Products, Spray Applied Cementitious Products, and Geosynthetic Fabric or Panel Products do not have thickness requirements.

Other ADC materials may be approved by the Board on a case-by-case basis. If a landfill operator proposes to use an ADC material not included in regulations specified in subsection 20690(b)(1-10), a site-specific demonstration project is required. Operators can only use material for ADC that can legally be disposed, and all ADC types must be approved by the Enforcement Agency (EA) in writing prior to use. Table 1 provides a brief description of the Board-approved ADC material types.

Table 1

Board-Approved ADC	Application/Thickness/Grain Size Requirements
Geosynthetic Fabric or Panel Products (Blankets)	Must be removed from the waste and the waste covered with new waste or approved cover materials within 24 hours of product placement unless product is non-reusable or EA approves use beyond 24 hours
Foam Products	Must be covered with waste or other approved cover materials within 72 hours of application. Cannot be applied if 40 percent chance of precipitation is forecast within 8 hours of application
Processed Green Material	Cannot be exposed for greater than 21 days. Grain size specification by volume: 95 percent less than 6 inches minimum. Compacted thickness of 6 inches and average compacted thickness of less than or equal to 12 inches
Sludge and Sludge-Derived Materials	Minimum of less than or equal to 12 inches.
Ash and Cement Kiln Dust Materials	Minimum compacted thickness of 6 inches and average compacted thickness of less than 12 inches
Treated Auto Shredder Waste	Minimum compacted thickness of 6 inches and average compacted thickness of less than 24 inches.
Contaminated Sediment, Dredge Spoils, Foundry Sands, Energy Resource Exploration and Production Wastes	Minimum compacted thickness of 6 inches and average compacted thickness of less than 12 inches
Compost Materials	Grain size specification by volume: 95 percent less than 12 inches and 50 percent less than 6 inches as determined by the EA. Minimum compacted thickness of 6 inches and average compacted thickness of less than or equal to 12 inches
Processed Construction and Demolition Wastes and Materials	Grain size specification by volume: 95 percent less than 6 inches minimum. Minimum compacted thickness of 6 inches and average compacted thickness of less than 18 inches.
Shredded Tires	Shredded Tires cannot be applied when 40 percent chance of precipitation is forecast within 8 hours of application. 50 percent by volume is smaller than 6 inches in length and no individual pieces are greater than 12 inches in length.
Spray Applied Cementitious Products	Cannot be applied when 40 percent chance of precipitation is forecast within 8 hours of application

Landfill operators must file a Report of Disposal Site Information (RDSI) with the EA to identify cover material quantities required from on-site sources, excavation sequence of the site, and stockpile locations if stockpiled for a significant amount of time. The RDSI must describe ADC and beneficial reuse waste types, processing methods,

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alternative processing or grain size specifications if applicable, operations methods, and applicable engineering, or other standard practices . The operator must estimate the tonnage of these materials that will be used based on waste types, applicable cover-to-waste volume ratios, applicable density conversion factors, engineering specifications, methods to minimize contamination, or other pertinent information. The RSDI must also contain the cover frequency proposed or the alternative daily cover proposed for use in lieu of soil as daily cover.¹⁰

ADC in Other States

Staff informally surveyed several states on their ADC policies. All states responding to the survey allow ADC use at landfills, but ADC material types vary by state. Table 2 is a summary of the responses (see Attachment 1 for more detailed responses).

Table 2

State	Commonly-Used ADC Material Types	Site-Specific Demonstrations on Projects Required	ADC Diversion Credit
Connecticut	Polluted soil (i.e., contaminated soil); treated polluted soil; plastic membranes or tarps; sprayed on foams; sprayed on slurries; casting sands; incinerated sewage sludge ash; dredge spoils; etc.	Yes	
Idaho	Chipped tires meeting size requirements, tarp-o-matic & posi-shell.	No	No
Indiana	Altered tires, Wood chips, Compost, Foundry sand, Geotextile, Plastic tarpaulin, Dewatered publicly owned treatment works sludge, Dewatered paper sludge. Petroleum contaminated soil, Soil contaminated with vegetable oil	Yes	Considered reuse
Maryland	Tarps, municipal incinerator ash, sewage sludge/soil mix, petroleum contaminated soil, auto shredder fluff, and Recovermat, a proprietary cover made of ground-up Construction and Demolition materials	Yes	No
Massachusetts	Sand blast grit, C&D Fines, Aggregate, Short Paper Fiber, Mixed fill, Baghouse fines from asphalt batching plant, Freedman scrap wire casings, Sludge ash, WTP residuals, Pond sediments, Contaminated soil, Processed Glass Aggregate, Coal bottom ash,, spent biofilter compost, dredged sediments, C&D Residual wood, Processed Fluorescent Glass	Sometimes	No
Michigan	Spray-on products, chipped tires, wood chips, ash from combustion of coal or wood, ground shingles and other material that do not contain friable asbestos, aluminum sludge from treatment of potable water at POTW's, foundry sand, dredge spoils, paper mill sludge, contaminated soil from leaking underground storage tanks containing petroleum products, auto fluff	Sometimes	No
Missouri	Tarps/geotextiles, Tire chips/soil (50/50 mixture), Fly ash/bottom ash mixture (up to 50% bottom ash), Spray-applied (Topcoat and similar products; Posi-shell), Petroleum contaminated soil, Other types of contaminated soil, Woods chips/soil (50/50 mixture) Virgin coal/soil (50/50 mixture), Foundry sand/soil (50/50 mixture)	Sometimes	No
Nebraska	Wood chips/soil mixture, petroleum contaminated soil, slag, auto fluff, tire shreds/chips, 4 mil polyethylene plastic tarp, cob ash, 60 mil tarp, foundry sand, commercial spray-on cover	Yes	Not considered disposal
New York	Petroleum-contaminated soils are major ADC use. Also use MSW/Wood Ash, Aggregate/Concrete/Glass, Processed C&D, Soil (Clean), POTW Incinerator Ash, Paper Mill Sludge, Industrial Waste, Plattco Sand, Shredder Fluff, Wood/Wood Chips, Industrial Waste, Foundry Sand, Powdered Glass, Sewage Sludge, Tire Chips	Usually not required	No
Ohio	Slurries, tarps, contaminated soil, foundry sand, coal combustion bottom ash, slag, and certain industrial residuals such as filter cakes.	Yes	No
Oregon	Commercial products such as geosynthetic tarps, and indigenous waste materials such as paper sludge, auto shredder fluff, and spent refractory (alumina brick).	Yes	No disposal fee on ADC
Rhode Island	C&D screenings, Auto shredder residue, Dredge spoils, contaminated soil, Incinerator Ash, Slag and Foundry sand , Recovermat (patent process that produces ground C&D waste) and posi-shell.	Yes	No
South Carolina	No list of pre-approved materials. State has allowed automobile shredder fluff, mixtures of wood-waste and soil (50-50 mix) some types of commercial sprays such as top-coat, and tarps	Yes	No
Utah	Non-hazardous contaminated soil, tarps, plastic sheets, foam products, products created from cement kiln dust, incinerator ash, non-hazardous auto shredder residue not otherwise regulated by 40 CFR Part 761, chipped waste tires, and spray-on materials.	No	No
Washington State	Alternative materials of an alternative thickness other than at least six inches (15 centimeters) of earthen material may be approved by the jurisdictional health department		
Wisconsin	Foundry sand, auto shredder fluff, some papermill sludges, contaminated soils bottom ash and slag.	Sometimes	Exempt from tipping fees
Wyoming	Any cover including no less than six (6) inches of compacted soil or any alternative material approved by the administrator to adequately control infiltration, disease vectors, fires, odors, blowing litter, and scavenging.	Sometimes	No

¹⁰ Title 27 CCR 21600 (b) (6) (A) (B) (C)

ADC Use in California

ADC use has increased approximately 129 percent since 1998 (1.7 million tons in 1998 to 3.9 million tons in 2007) while statewide disposal has increased approximately 6 percent (37.4 million tons in 1998 to 39.6 million tons in 2007). Table 3 illustrates statewide ADC use by material type.¹¹

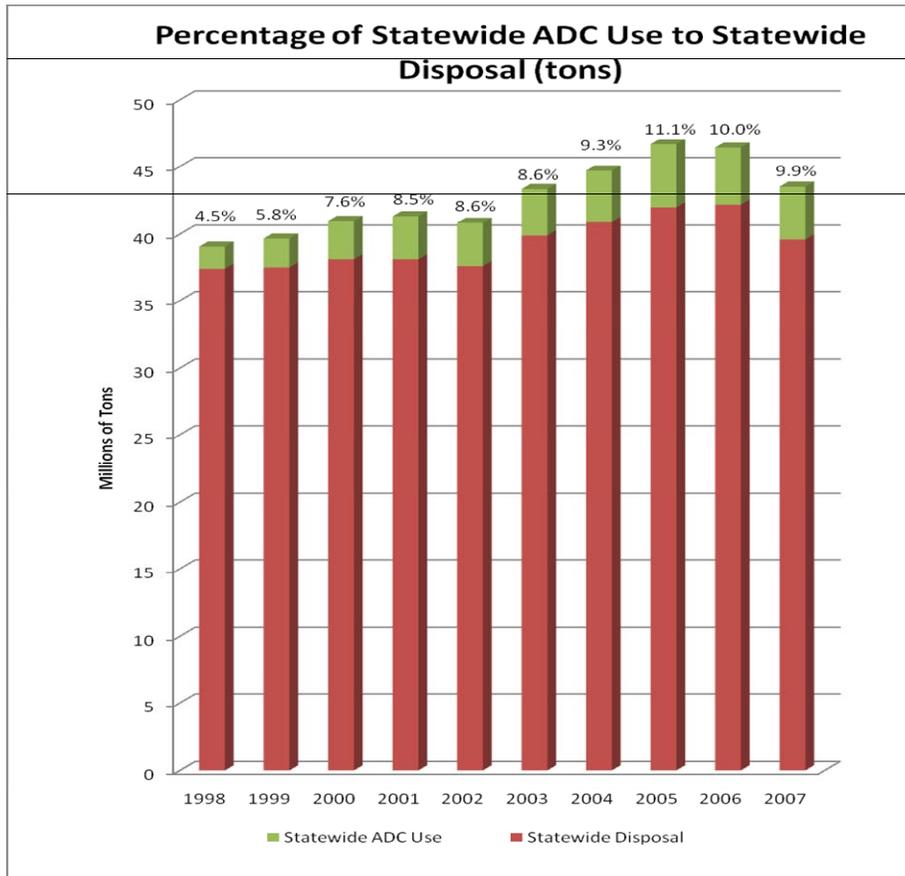
**Table 3
Statewide Alternative Daily Cover (ADC) by Material Type**

YEAR	ASH	AUTO SHREDDER WASTE	C & D	COMPOST	CONTAMINATED SEDIMENT	GREEN MATERIAL	MIXED	OTHER	TIRES	SLUDGE	TOTAL
1998	8,385	162,641	67,230	0	95	1,083,697	11,639	10,789	33,874	292,631	1,670,982
1999	7,445	237,256	188,920	472	17	1,381,123	4,783	20,911	11,333	320,546	2,172,805
2000	39,166	276,783	557,976	6,340	581	1,647,603	54,886	34,957	13,759	248,130	2,880,182
2001	35,226	349,827	567,599	13,575	69,170	1,962,770	31,394	31,112	17,188	152,887	3,230,748
2002	15,022	388,250	353,148	4,005	17,286	2,196,849	42,419	31,332	24,217	171,825	3,244,353
2003	4,441	442,752	209,729	8,473	0	2,394,595	13,420	63,156	19,468	291,262	3,447,296
2004	2,873	412,901	168,170	2,106	0	2,630,902	43,154	107,924	66,139	364,203	3,798,373
2005	7,073	683,108	326,467	1,546	40	3,023,306	26,271	214,906	36,205	350,751	4,669,674
2006	2,255	683,064	383,619	0	77	2,656,850	28,145	126,052	40,931	298,998	4,219,992
2007	1,566	632,495	358,784	3,379	40,960	2,307,255	12,588	172,311	66,042	326,680	3,922,060

¹¹ <http://www.ciwmb.ca.gov/LGCentral/Rates/Graphs/RateTable.htm> The Board has tracked ADC use since 1995 but detailed ADC material type data was not collected prior to 1998.

Statewide ADC use in comparison to statewide disposal increased from 1998 to 2005 but has been decreasing since 2006 (See Table 4). The increase in ADC use may be partly attributable to the 1998 regulation revisions that allowed landfill operators to use Board-approved ADC types without having to perform site-specific ADC demonstration projects.

Table 4¹²



Green material (59%), Auto Shredder Waste (16%), Construction & Demolition (9%), and Sludge (8%) are the largest ADC material types used today in California. Table 5 shows the total statewide ADC use by material type at Board-permitted landfills for 1998 through 2007. The majority of ADC use is in Southern California and the San Francisco Bay Area (Table 6).

¹² CIWMB Disposal Reporting Data

Table 5¹³

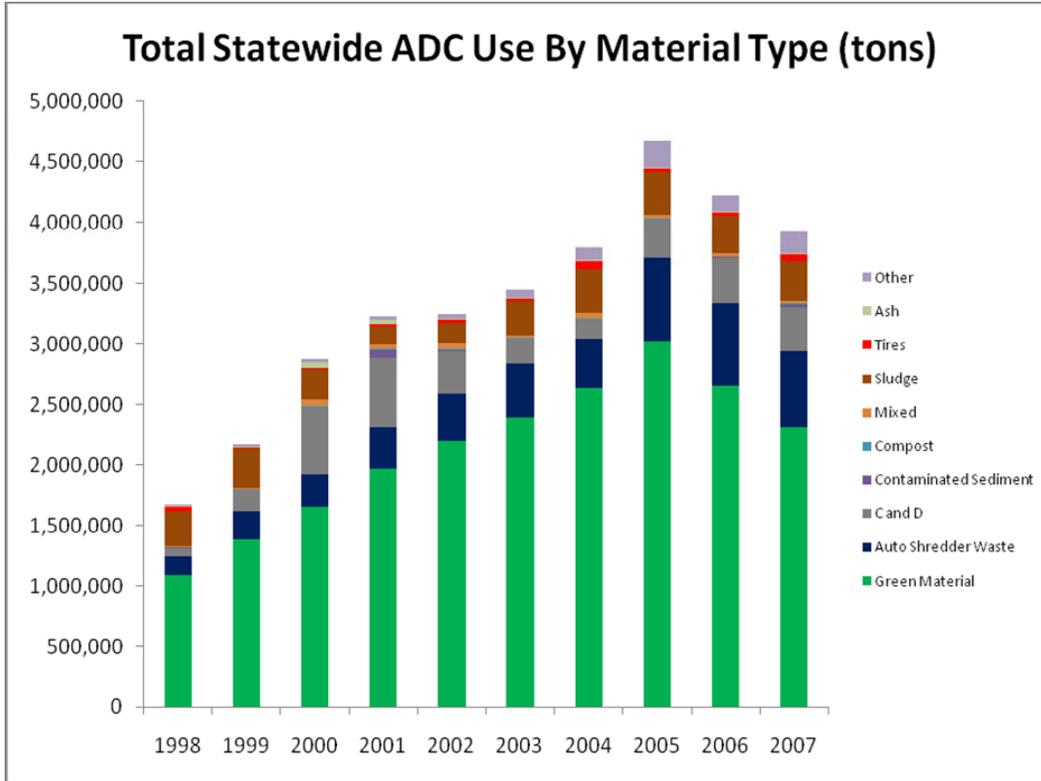
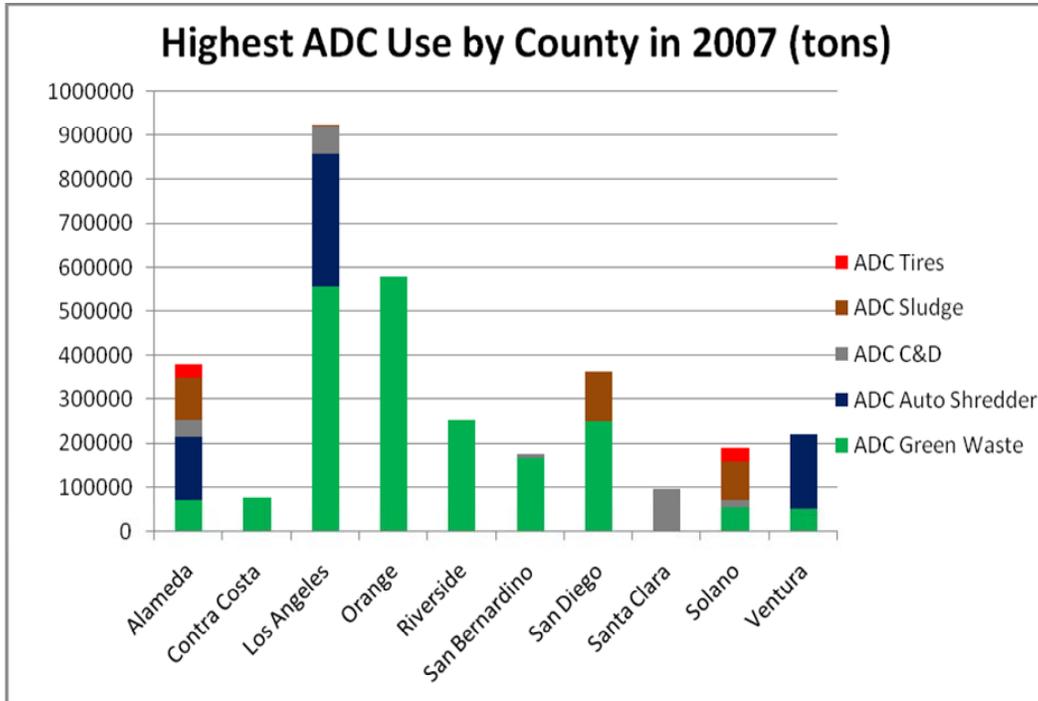


Table 6¹⁴



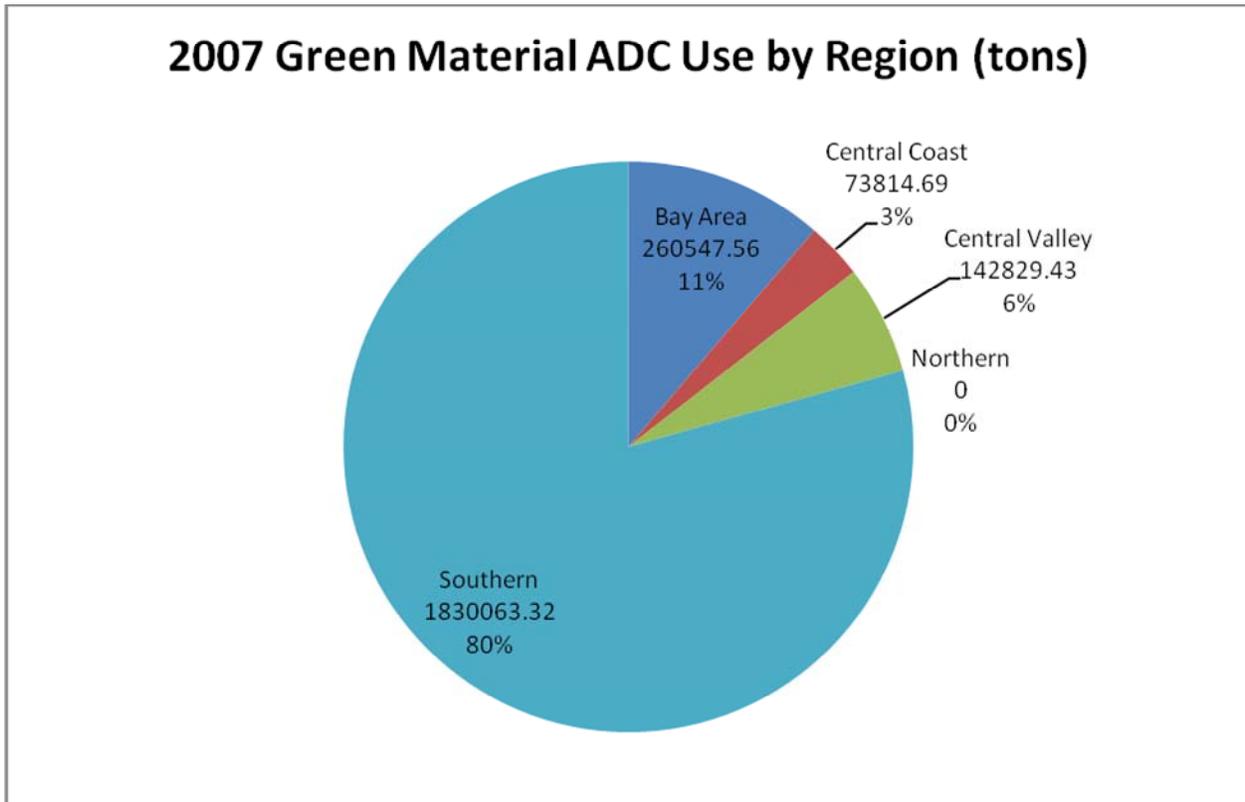
¹³ CIWMB Disposal Reporting Data

¹⁴ CIWMB Disposal Reporting Data

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Green material ADC use has doubled since 1998 (1.1 million tons in 1998 to 2.3 million tons in 2007) but has been decreasing since 2006 along with statewide disposal. In 2007, the Southern Region used the vast majority of green waste ADC in the state, accounting for 1.83 million tons (approximately 80% of the statewide total). The San Francisco Bay Area Region used 0.26 million tons (approximately 11% of the statewide total), and the Central Valley Region used 0.14 million tons (approximately 6% of the statewide total). The Central Coast Region used 0.07 million tons (accounting for only 3% of the statewide total) and the Northern Region used only a negligible amount. (See Table 7)

Table 7 ¹⁵



Determining the impact of green material ADC use on the compost/mulch industry has been difficult. At the January 25, 1995 Board meeting, staff presented scenarios estimating maximum green waste ADC use in California. Green waste ADC use estimates were based on variety of assumptions, such as small landfills would not use green waste ADC because of the cost of grinding equipment, many of these landfills were expected to close due to Subtitle D requirements, and the estimated use of other ADC material types at landfills. Green waste ADC estimates were calculated using three statewide total depths: 6 inches, 12 inches, and 18 inches. Based on these assumptions, CIWMB staff estimated maximum green waste ADC use as follows:¹⁶

... State wide total depth at 6"	644,087 tons
... State wide total depth at 12"	1,388,174 tons
... State wide total depth at 18"	2,082,261 tons

¹⁵ CIWMB Disposal Reporting Data

¹⁶ January 25, 1995 Board Meeting, Agenda Item 10

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However, disposal reporting for 1995 showed 390,201 tons of green waste ADC, and preliminary reporting for 1996 showed 560,266 tons of green waste ADC.¹⁷ The results indicated that the amount of green waste used as ADC was well below the maximum projections of 2 million tons. Based on the California Organic Recycling Council's (CORC) surveys of their members, production of compost products increased during this time frame from 2.1 million tons in 1995 to 4.2 million tons in 1996.¹⁸

CIWMB staff presented two discussion items to the Board in 2008 in regards to green material ADC. On March 18, 2008, Board staff presented options to the Board which included bans and phase-out on the use of ADC or disposal of organics in landfills, changes to diversion credits, disposal fees and surcharges, and increased inspection and enforcement. On June 17, 2008, CIWMB staff presented results from the ADC Policy Working Group and staff analysis and suggestions which included : 1) encouraging local jurisdictions to implement re-use and purchase policies and programs for organics/compost; 2) disposal and tipping fees on ADC; 3) requiring local jurisdiction plans to include a diversion processing capacity provision; 4) promoting local contracting mechanisms; and 5) developing timeframes and mechanisms for phasing out green material ADC diversion credit. CIWMB staff presented a timeline for these activities in an update of the Organics Roadmap I & II at the December 16, 2008 Board meeting and continue to with work with stakeholders on these issues.

Many stakeholders have stated that counting green material ADC as beneficial reuse and not disposal has led to increased use of green material ADC. Stakeholders further state that use of green waste as ADC has had a negative impact on the compost infrastructure and other industries that compete for green material feedstock. Other stakeholders indicate that counting ADC use as disposal would negatively impact some jurisdiction diversion rates and remove the some of the incentive to use green material beneficially at landfills. In addition, some stakeholders have pointed out that there are inadequate markets and/or processing capacity for green waste other than ADC in Southern California due to difficulties encountered in developing and gaining local approvals for new facilities, lack of suitable land, strict air quality regulations, and communities unwilling to host processing facilities.

Organic Materials Processing Infrastructure

Landfills are required to report ADC use via the CIWMB's Disposal Reporting System, but compost and mulch facilities and operations are not required to submit production data to the CIWMB. In order to obtain a better understanding of California's organic materials management industry, the CIWMB conducted surveys in 2001 and 2003 to obtain data on the number of producers, feedstock sources, products, and markets for compost and mulch. Participants were grouped into two major categories: composters—entities that actively compost organic material, and processors—entities that process material but do not intentionally or actively compost the materials they produce. Results from the 2003 survey include:¹⁹

- ... 101 composters and 69 processors participated in the survey
- ... Approximately 10 million tons of organic materials were processed in California
- ... 18 million cubic yards of organic material products were produced
- ... Major product categories
 - o ADC (46%)
 - o Boiler Fuel (21%)
 - o Compost (16%)
 - o Mulch (13%)

¹⁷ February 26, 1997, Board Meeting, Agenda Item 26

¹⁸ February 26, 1997, Board Meeting, Agenda Item 26, Attachment 7

¹⁹ [Second Assessment of California's Compost- and Mulch Producing Infrastructure](#)

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Currently, there are approximately 313 active compost facilities/operations and processors in California: 122 Permitted facilities and 210 EA Notification.²⁰ The Board funded a compost infrastructure survey of compost and mulch producers in California (scheduled to be completed in 2009) and the [Recycling and Waste Management Infrastructure project](#), which will provide a centralized source of information on California solid waste management and recycling infrastructure, including compost and mulch operations (scheduled to be completed in the Spring of 2010). Data obtained from these research projects may help quantify the impact of green material ADC use on the compost/mulch industry in California.

ADC Regulation Issues

CIWMB staff interviewed landfill operators, Local Enforcement Agencies (LEA), consultants, environmental groups, other CIWMB staff to identify the issues related to ADC use at landfills. Staff also visited landfills, contacted representatives from other states, and performed a literature search to gather comprehensive information on ADC. Based on the information gathered from these sources, staff has identified the following ADC issues and provided potential options to address these issues:

- 1. The optimum amount, depth, and quality of Board-approved ADC have not been adequately researched.**
- 2. The specifications for some ADC materials make it difficult to evaluate compliance through periodic inspections. The current regulatory regime could allow the misuse of ADC to go undetected.**
- 3. ADC often contains materials that are not allowed to be included in the material types (contaminants). For example, many feedstocks for C&D ADC include materials that are not listed as allowable in C&D ADC, such as wallboard.**
- 4. Many stakeholders believe that the CIWMB's site-demonstration project requirements for new ADC materials lack specific requirements on how to conduct the demonstrations. Several landfills are implementing ADC demonstration projects using Material Recovery Facility (MRF) and C&D fines. The fines are produced from various feedstocks and processes, and the constituents of the material can vary greatly. A procedure for evaluating MRF and C&D fines as ADC needs to be refined and tested.**
- 5. The definition of Green Material in the compostable materials handling regulations is different than the ADC definition of Processed Green Material**
- 6. The CIWMB's Strategic Directive (SD) 6.1 aims to reduce the amount of organics in the waste stream by 50% by 2020. Organic waste-derived ADC is considered beneficial reuse and not disposal which is a disincentive to keep green material out of the waste stream.**
- 7. Using organic materials to reduce greenhouse gas emissions at landfills is currently being researched**

²⁰ Solid Waste Information System, April 16, 2009

8. As of the writing of this paper, the Department of Toxic Substances Control was in the process of reexamining Auto Shredder Waste (ASW), and its Reclassification as a hazardous waste would require ASW to be treated so that is not hazardous or to be disposed in a Class I landfill.

The following section examines the above issues and proposes potential options to address these issues

1. The optimum amount, depth, and quality of Board-approved ADC have not been adequately researched.

The CIWMB adopted "Procedural Guidance for the Evaluation of Alternative Covers" on May 17, 1990. Site-specific demonstration projects were required to establish that an ADC can function as a barrier to the 1) emergence or attraction of vectors, 2) progression of landfill fires within the landfill, 3) escape of odor, and 4) excess infiltration, and 5) scavenging. Streamlined approval procedures were established for two successfully-tested ADC materials, geosynthetic blankets (LEA Advisory No. 10, March 7, 1994) and shredded green material (LEA Advisory No. 19 (Revised), May 15, 1995) both of which have been superseded by [Advisory 48](#). Approximately one hundred eleven (111) site-specific demonstration projects were conducted at approximately 82 municipal solid waste landfills in California. The most common ADC materials used included geosynthetic blankets (55 projects) and shredded green material (27 projects). Other ADC materials used included foam products, sludge, ash, and treated auto shredder waste.²¹ ADC regulations, effective on February 3, 1998, were based on the results of ADC demonstration projects and established a number of ADC material types that did not require additional demonstration prior to making a request to use at a site. The regulations also included the ability to continue to propose demonstrations for other ADC materials types not included in the regulations.

Demonstration project evaluation was based primarily on visual observations on the performance of ADC made during periodic inspections. There was no one standardized approach to the evaluation, and no comprehensive testing of the materials performance. A 1993 US EPA report indicated that evaluating the effectiveness of ADC was generally "based on subjective comparisons with soil cover".²² Board staff analysis of ADC demonstrations took into account several studies published in the early 1990's (US EPA, Allegheny College, George Tchobanoglous, GeoSyntec Consultants). Staff is not aware of any recent studies on the performance of ADC materials.

Given the wider use of ADC materials and degree of variation in the type, quality, and quantity of material used at landfills, there is less certainty that the demonstration projects conducted in the 1990's upon which the original set of ADC requirements was based is still applicable to the amount and types of ADC used today. A reevaluation of the current suite of ADC materials should be undertaken to determine the optimum amount, depth, quality, etc. that is required to meet the performance requirements of ADC as well as to conserve landfill capacity. A set of measurable ADC performance parameters would need to be identified and used in a systematic evaluation of all currently-approved material types. In addition, ADC standards should not negatively impact landfill operations, such as generating landfill gas, exposing workers to hazardous materials, etc.

Option 1: Require landfill operators to research the optimum amount, depth, and quality of ADC materials.

Option 2: CIWMB staff partners with LEA's and operators to research the optimum amount, depth, and quality of ADC materials

²¹ <http://www.ciwmb.ca.gov/RuleArchive/1998/ADC/isoradc.doc>

²² *Use of Alternative Materials for Daily Cover at Municipal Solid Waste Landfills*, prepared for US EPA by Pittsburg University, PA September 1993

Option 3: CIWMB conducts research on the optimum amount, depth, and quality of ADC materials

2. *The specifications for some ADC materials make it difficult to evaluate compliance through periodic inspections. The current regulatory regime could allow the misuse of ADC to go undetected.*

Processed Green Material, Sludge or sludge-derived materials, Ash and Cement Kiln Dust, Treated auto shredder waste, Contaminated Sediment, Dredge Spoils, Foundry Sands, Energy Resource Exploration and Production Wastes, Compost materials, Construction and demolition wastes, and shredded tires have minimum and maximum compacted thickness, and some also have size requirements and material type limits (See Table 1). Subsection 20690 (a)(7) requires waste-derived materials used as ADC to be restricted to quantities no more than necessary to meet the performance requirements for ADC.

The Board determined on January 25, 1995 that the maximum average thickness of shredded green waste should not exceed 12 inches. Regulations approved on February 3, 1998 required that processed green be restricted to a minimum compacted thickness of 6 inches and average compacted thickness of less than or equal to 12 inches. ADC demonstration projects and input from the LEAs and landfill operators indicated that 12 inches of shredded green material functioned as suitable cover and protected public health and safety. Green material ADC applied at significantly higher thicknesses could increase the threat of landfill fires with drying and could cause unacceptable odors with decomposition. Landfill operators must balance the need for controlling vectors versus preserving landfill capacity.²³

CIWMB staff considered a prescriptive limit on maximum ADC use (i.e. tonnage limit). However, landfill operations vary in acceptable waste-to-cover material volumes so that a prescriptive limit would be difficult to establish on a statewide basis. Some stakeholders have indicated that there are physical and practical limitations that prevent the application of excessive thicknesses of ADC, such as equipment slippage, reduced compaction, loss of airspace, contractual agreements, and loss of the associated disposal fees. Other stakeholders indicated that the amount of alternative daily cover should be monitored closely to avoid excessive thickness. Concerns related to excess alternative daily cover include: increased/inaccurate diversion credit, lost landfill capacity, wasted materials (especially green waste), and misapplication (intentional/or unintentional).²⁴

Monitoring ADC use compliance with the thickness requirements at landfills is problematic because inspections are conducted once a month and the use of ADC can only be evaluated during the inspection day. There is no standardized method to determine if ADC use is consistent with the standards on an ongoing basis. ADC monitoring could involve numerous measurements, prescriptive standards or complicated sampling procedures, rather than visual observations and performance evaluations, and this would impact the amount of time and resources required for additional monitoring. Operators are required to report in their RDSI's a tonnage estimate of ADC materials that will be used based on waste types, applicable cover-to-waste volume ratios, applicable density conversion factors, engineering specifications, methods to minimize contamination, or other pertinent information.

Option 1: Establish in regulation a refuse-to-ADC ratio at landfills with high refuse-to-ADC ratios warranting further investigation or require operators to record working face size and corresponding ADC use on the working face to enable LEAs to determine overuse or underuse.

²³ <http://www.ciwmb.ca.gov/RuleArchive/1998/ADC/>

²⁴ February 11, 1997 Permitting and Enforcement Committee Meeting, [Agenda Item 15](#)

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Option 2: *Leave thickness requirements at current levels and improve methods for monitoring*

Option 3: *Tighten requirements in the Report of Disposal Site Information so that operators provide better information on ADC use.*

3. *ADC often contains materials that are not allowed to be included in the material types (contaminants). For example, many feedstocks for C&D ADC include materials that are not listed as allowable in C&D ADC, such as wallboard.*

Landfill operators are required to use green material as ADC that meets the definition and specifications in (20690 (b) (3))²⁵. As seen by the below pictures, there have been occurrences when green waste ADC did not meet the definition and specification requirements.

Green Material ADC Contamination



Higher levels of green material contamination are often found in collection and processing systems where green materials are destined for ADC use. In addition, many jurisdictions are adding food waste to their curbside green waste collection programs, and green waste mixed with food material cannot be used as ADC. Processed

²⁵ 20690 (b)(3) Processed Green Material

(A) For the purposes of this section, processed green material means any plant material that is either separated at the point of generation, or separated at a centralized facility that employs methods to minimize contamination. Green material includes, but is not limited to, yard trimmings, untreated wood wastes, paper products, and natural fiber products. Green material does not include treated wood waste, mixed demolition or mixed construction debris, manure and plant waste from the food processing industry, alone or blended with soil. Processed green material may include varying proportions of wood waste from urban and other sources and shall be ground, shredded, screened, source separated for grain size, or otherwise processed.

(B) Green material used for alternative daily cover shall be processed prior to being applied to the working face unless the green material to be used as alternative daily cover already meets the grain size specifications. Prior to spreading and compacting on the working face, processed green material shall comply with a grain size specification by volume of 95 percent less than 6 inches. Alternative processing and grain size specification requirements may be approved by the EA if the EA determines that the alternative meets the performance requirements of ¶(a)(2) and (a)(3) of this section and the CIWMB concurs.

(C) Processed green material shall be restricted to a minimum compacted thickness of 6 inches and average compacted thickness of less than or equal to 12 inches.

(D) Processed green material placed as cover shall not be exposed for greater than 21 days.

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Green Material in 20690 (b) (3) (A) does not specifically prohibit food material, and the CIWMB may want to consider excluding food material in the definition of Processed Green Material in the future.

Processed C&D has a list of materials that can be included in ADC: rock, concrete, brick, sand, soil, ceramics, cured asphalt, lumber and wood, wood products, roofing material, plastic pipe, plant material when commingled from construction work, and fines derived from processing the above materials.²⁶ C&D ADC observed at landfills contain additional materials than listed in the definition of Processed C&D.

C&D materials often contain wallboard. Wallboard is not included in the definition of C&D ADC, and landfill operators must conduct site-specific demonstration projects utilizing ADC that includes wallboard. If the material proves effective, operators can request to use the material on an ongoing basis. It is staff's understanding that wallboard was excluded from C&D ADC because of concerns relative to the generation of hydrogen sulfide gas. Many landfills are now accepting large quantities of construction and demolition (C&D) debris in addition to municipal solid waste (MSW), and gypsum wallboard can generate hydrogen sulfide gas (H₂S) in a landfill.²⁷

Option 1: Redefine ADC types to account for material variance

Option 2: Base contamination level thresholds on volume instead of weight

Option 3: CIWMB sponsors a study of additional ADC material types

Option 4: Leave definition of C&D ADC as is and continue to require landfill operators to conduct demonstration projects to ensure C&D ADC with gypsum wallboard can meet minimum standards for cover and not generate hydrogen sulfide

Option 5: Change definition of C&D ADC to include gypsum wallboard.

Option 6: CIWMB researches hydrogen sulfide generation in landfills that receive C&D materials

- 4. Many stakeholders believe that the CIWMB's site-demonstration project requirements for new ADC materials lack specific requirements on how to conduct the demonstrations. Several landfills are implementing ADC demonstration projects using Material Recovery Facility (MRF) and C&D fines. The fines are produced from various feedstocks and processes, and the constituents of the material can vary greatly. A procedure for evaluating MRF and C&D fines as ADC needs to be refined and tested.***

Regulations require that any potential use of a new ADC material or listed ADC material used in a manner different from the standard be subject to a site-specific demonstration project approved by the LEA with

²⁶ 20690 (b) (9) Processed Construction and Demolition Waste and Material : *Processed construction and demolition wastes and materials used as alternative daily cover shall be restricted to the following materials: rock, concrete, brick, sand, soil, ceramics, cured asphalt, lumber and wood, wood products, roofing material, plastic pipe, plant material when commingled from construction work, and fines derived from processing the above materials.*

²⁷ http://www.gtp-merichem.com/support/technical_papers/municipal_landfills.php

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concurrence at the CIWMB staff level.²⁸ The following are suggested guidelines for ADC site-specific demonstration projects per LEA Advisory #48—Revised March 27, 1998:

A site-specific written proposal should be submitted describing, at a minimum:

Responsible parties for the project and chain-of-command.

Time frame of project.

Material specifications, stockpiling, processing, placement procedures.

Maximum time period of exposure as ADC or AIC and projected quantity of materials to be tested;

Expected ability of the material in meeting the performance requirements of 27 CCR 20690(a)

Board staff, in consultation with LEAs, may want to consider developing a standardized guidance document that spells out more clearly what should be in the demonstration project. The guidance document could address operational practices to be followed when using the ADC (how the ADC will be deployed and removed, wet and cold weather operations, high wind operations, run-off control, special filling methods), and require a detailed description of how the proposed ADC will be evaluated.

Several landfills are conducting ADC demonstration projects using MRF and C&D & fines. Many jurisdictions have enacted C&D recycling ordinances which require mandatory diversion percentages, and stakeholders have indicated that diversion goals are difficult to achieve without processing MRF and C&D fines and using them as ADC. MRF and C&D fines are difficult to process into homogeneous products because feedstocks are highly variable depending on the makeup of incoming loads as well as the process used (screen size, front screening versus secondary screens).

Staff have visited facilities throughout the state that are conducting demonstration projects using fines. Staff have observed a wide variety of constituents and sizes in the materials, including dirt, gypsum (wallboard), wood, glass, plastic, cell phones, batteries, plastic bags, polystyrene, tennis balls, caulk tubes, food waste, CRV containers, and hard plastics (see following pictures). Although the fines placed on the working face may resemble the waste it is covering (“waste on waste”), operators indicate that it performs adequately in its ability to control odors, vectors, litter and scavenging.

MRF/C&D Processing Facility Fines



²⁸ 27 CCR, Sections 20680, 20690.

MRF Fines



The types of constituents appear to be related to the screen size when processing the material. Smaller screen sizes (2" minus) seems to consistently produce material that is high in small grain inert material that looks and acts similar to a fine grain soil. The following pictures illustrate C&D fines processed through a 3/8 inch screen. The fines are currently being used in land application/soil amendment.

C&D Fines: 3/8 inch screen



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C&D fines often contain gypsum wallboard, and there are concerns about generation of hydrogen sulfide when the material gets wet. There is also concern about homes and commercial buildings constructed from the early 1900s to the 1970s often contained asbestos cement wallboard.²⁹ Most recently, wallboard imported from

China has been found to readily produce hydrogen sulfide gas.³⁰ Hydrogen sulfide generation from processed C&D has been documented in Massachusetts and New York; C&D fines are considered unsuitable for ADC in Ohio due to significant potential for dust and asbestos fibers; and drywall must be removed prior to processing C&D fines in Minnesota (see Attachment 1). Testimony provided by stakeholders when the Board developed C&D and Inert Waste regulations indicated that over 60 types of toxic and potentially toxic materials may be used on construction sites that frequently end up in C&D debris bins for management as waste.³¹

One study³² indicates that wallboard provides sulfate ions and organic matter for sulfate-reducing bacteria (SRB) to produce a large concentration of hydrogen sulfide. Possible hydrogen sulfide control could be the addition of large amounts of drywall to buffer the pH out of the ideal SRB pH range or by adding crushed concrete either with the waste or as a cover layer.

Option 1: *CIWMB develops guidance document on site-specific ADC demonstration projects.*

Option 2: *Retain current demonstration guidelines in regulation*

Option 3: *Revise regulations to specify requirements on how to conduct ADC demonstration projects*

Option 4: *The CIWMB establishes grain size specifications for MRF & C&D fines to reduce visible contaminants*

Option 5: *Require testing for asbestos, other hazardous materials, and gas generation as part of ADC demonstration projects and report findings. The results should help to determine if the materials types are suitable for ADC use.*

Option 6: *Require landfill operators to conduct demonstration projects to ensure C&D ADC with gypsum wallboard can meet minimum standards for cover and not generate hydrogen sulfide*

5. The definition of Green Material in the compostable materials handling regulations is different than the ADC definition of Processed Green Material

²⁹ <http://www.asbestos.com/products/cement/cement-wallboard.php>
<http://www.asbestos.net/asbestos-products/asbestos-wallboard.html>

³⁰ <http://www.theprovince.com/news/Toxic+wallboard+turning+Canada/1375780/story.html>
http://www.chinesedrywall.com/uploads/Environ_report.pdf

³¹ August 12, 2002 Permitting and Enforcement Committee Meeting.
<http://www.ciwmb.ca.gov/Agendas/MtgDocs/2002/08/00012716.pdf> page 78

³² *Hydrogen Sulfide Generation in Simulated Construction and Demolition Debris Landfills: Impact of Waste Composition.* Journal of Air & Waste Management Assoc. 56: pp. 1130-1138 August 2006

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In the compostable materials handling regulations (Title 14, 17852 (a) (21)) , green material means any plant material that is separated at the point of generation, contains no greater than 1.0 percent of physical contaminants by weight, and meets the requirements of section 17868.5. Green material includes, but is not limited to, yard trimmings, untreated wood wastes, natural fiber products, and construction and demolition wood waste. **Green material does not include food material**, biosolids, mixed solid waste, material processed from commingled collection, wood containing lead-based paint or wood preservative, mixed construction or mixed demolition debris.

In the ADC regulations (Title 27,20690 (b) (3) (A)), processed green material means any plant material that is either separated at the point of generation, or separated at a centralized facility that employs methods to minimize contamination. Green material includes, but is not limited to, yard trimmings, untreated wood wastes, paper products, and natural fiber products. **Green material does not include** treated wood waste, mixed demolition or mixed construction debris, **manure and plant waste from the food processing industry**, alone or blended with soil. Processed green material may include varying proportions of wood waste from urban and other sources and shall be ground, shredded, screened, source separated for grain size, or otherwise processed.

Although CIWMB staff have not heard of major problems related to differences in the definitions between green material and processed green material, the definitions are not consistent and could cause some confusion in the field. For example, the definition of green material in the composting materials handling regulations does not include food material while the definition of green material in the ADC regulations does not specifically prohibit all types of food material, so some operators may conclude that the green material containing post-consumer food is acceptable for ADC use.

Option 1: *Leave the current definitions of green material and processed green material in regulation.*

Option 2: *Make the definition of Processed Green Material in the ADC regulations the same as the Green Material definition in the compostable materials handling regulations*

6. *The CIWMB's Strategic Directive (SD) 6.1 aims to reduce the amount of organics in the waste stream by 50% by 2020. Organic waste-derived ADC is considered beneficial reuse, not disposal, which is a disincentive to keep green material out of the waste stream.*

The Board adopted a set of Strategic Directives (SD) February 13, 2007, including SD 6.1 which aims to reduce the amount of organics in the waste stream by 50% by 2020. Current statute (Public Resources Code Section 41781.3) states that the use of waste-derived ADC constitutes diversion through recycling, and this policy appears to conflict with SD 6.1. However, this legislation also required the Board to adopt ADC regulations that consider “**conditions necessary to provide for the continued economic development, economic viability, and employment opportunities provided by the composting industry in the state**”.

The CIWMB held an Organics Summit on October 10, 2007 with the purpose of exchanging ideas and developing a plan for the future for compostable and cellulosic organic materials. Staff assessed the various issues raised by stakeholders at the Organics Summit and developed the Organics Policy Roadmap which was presented to the Board in December 2007. The Organics Roadmap identified six key issue categories that require more focused work and consideration by the Board: ADC policy, economic incentives, siting and capacity, regulatory and permitting, research, and education.

Board staff presented an ADC policy item to the Board in March 2008 that included historical ADC usage, legislative and regulatory history, existing markets, and potential policy options. These options included: 1)

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increase fees on green material ADC use, 2) define green material ADC use as disposal, not beneficial reuse, and 3) continue emphasis on inspection and enforcement to address ADC overuse and misreporting.

At the March 11, 2008 meeting of the Strategic Policy Development Committee, the Committee directed staff to convene a workgroup to focus on developing five specific options for reducing green material ADC. At the June 17, 2008 Board meeting, staff presented the workgroup's analyses of the 5 options along with staff's analysis and suggestions.

- ... Option 1: Requiring local jurisdictions to implement re-use and purchase policies and programs for organics/compost
- ... Option 2: Disposal and tipping fees on ADC
- ... Option 3: Requiring local jurisdiction plans to include a diversion processing capacity provision
- ... Option 4: Promoting local contracting mechanisms
- ... Option 5: Developing timeframe and mechanism for phasing out green material ADC diversion credit.

CIWMB staff is currently working with stakeholders to develop an "Organics Toolbox" to support municipal use of compost (Option 1) and include a local contract mechanism component in the organics toolbox to assist local governments in implementing contract provisions that support diversion of green materials from disposal at landfills (Option 4). CIWMB staff is also developing a legislative concept on a 15-year diversion processing capacity requirement (Option 3), while Option 2 and Option 5 will require legislative and statutory changes.

Green material ADC use has increased from 1.1 million tons in 1998 to 2.3 million tons in 2007. Many stakeholders believe green material ADC use has increased because it does not count as disposal and helps jurisdictions meet their AB 939 diversion goal mandates. ADC is not subject to the Board's \$1.40 per ton disposal fee, and this reduces potential funding for Board programs. Representatives of several composting facilities have also voiced their concern that green material ADC usage prevents an increase in their production of compost. Other stakeholders believe counting ADC as disposal would negatively impact jurisdiction diversion rates and preclude the beneficial use of green material in landfills. In addition, some claim there is inadequate processing capacity for green waste in Southern California and limited market for compost made from green waste due to difficulties encountered in permitting/developing new facilities (lack of suitable land, strict air quality regulations, NIMBYism).

Green material ADC use also raises environmental issues among stakeholders. Some stakeholders believe the decomposition of organic materials in landfills with anaerobic environments results in methane generation before landfill gas recovery systems can be installed, and methane is 23 times more powerful as a greenhouse gas than carbon dioxide. Other stakeholders believe green material ADC is beneficial in generating methane which can be captured and used as energy, and using soil as daily cover instead of green material ADC may interfere with efficiently capturing methane.

Green material ADC continues to spark controversy among stakeholders throughout the state. Most changes to existing ADC policy will require statutory amendments and consideration of regional market impacts, particularly in the Southern and Bay Area Regions.

Option 1: Monitor ADC Policy Working Group implementation activities and results of the Board's life cycle assessment of organics diversion alternatives study to determine how regulations are affected

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Option 2: Pursuant to Public Resources Code Section 41781.3, the CIWMB researches the economic impacts of green material ADC on the compost industry

Option 3: CIWMB researches the impacts of using soil versus organic material ADC on landfill gas recovery and quantifies the amount of landfill gas generated using soil versus organic material ADC.

7. Using organic materials to reduce greenhouse gas emissions at landfills is currently being researched

Several studies are examining methane emissions at landfills and the potential of applying biocovers over the surface of landfills to reduce methane emissions. Below are summaries of some of this research:

[The Compost Cover At Landfills Methane Emissions Reduction Demonstration Project](#)

The CIWMB is funding research to assess the long-term performance and effectiveness of using a biocover to help mitigate methane emissions over the surface of a landfill. The use of a biocover may potentially offer smaller landfills a cost-effective alternative for mitigating methane to comply with the California Air Resources Board's (ARB) [Landfill Methane Control Measure](#). Two demonstration cells will be constructed at the Yolo County Central Landfill: one will consist of fresh green material, and the other cell will utilize existing degraded green material that was used under a separate contract with the California Energy Commission (CEC), PIER Program. The project will include conducting field and laboratory testing; developing a predictive computer model; and developing a final report on biocover performance based on the results of the computer model and laboratory results.

[Economic Analysis and Life Cycle Assessment of Diversion Alternatives](#)

The Board is working with RTI International, R.W. Beck, Matthew Cotton, and Dr. Sally Brown to perform a life cycle assessment of organics diversion alternatives in support of the [California Global Warming Solutions Act of 2006 \(AB 32\)](#). The objectives of this project are to quantify greenhouse gas (GHG) emission reductions from implementation of organic diversion alternatives, and to perform an economic analysis to determine the associated costs and savings of the selected alternatives on a regional and statewide basis.

[A New Field-Validated Inventory Methodology for Landfill Methane Emissions](#)

The California Energy Commission (CEC), in partnership with the CIWMB and the Air Resources Board, is developing a methodology to quantify methane (CH₄) emissions at landfills in the context of the California greenhouse gas (GHG) inventory. The project shifts the focus from landfill CH₄ generation modeling to identifying landfill CH₄ emissions through daily, intermediate, and final cover materials at landfills which vary throughout California. This inventory methodology for landfill methane emissions relies on field-validated modeling of "net" emissions (including methane oxidation) rather than methane generation. This approach has fewer uncertainties than the previous indirect modeling methodology and can be directly field-validated. The project is scheduled to be completed in 2010.

[Comparison of Use of Green Wastes as Alternative Daily Cover in Regulation Landfills and by Composting in Open Windrows and In-vessel Systems](#)

The study examines the best available technology for processing green wastes. It consists of two parts: an in-depth study of the tonnages of green wastes processed by various aerobic composting methods and a multi-criteria analysis to identify the best of these methods; and a comparison of the environmental impacts of using green wastes as feedstock for aerobic composting or as Alternative Daily Cover in regulated landfills.

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The CIWMB will await the results of these studies to help develop regulations and Best Management Practices to mitigate landfill gas emissions.

8. As of the writing of this paper, the Department of Toxic Substances Control is in the process of reexamining Auto Shredder Waste (ASW), and its Reclassification as a hazardous waste would require ASW to be treated so that is not hazardous or to be disposed in a Class I landfill.

Automobile shredder waste consists of seat covers, dashboards, carpet, seat cushion foam, bumper plastic, broken safety glass, wire, hoses, rubber gaskets, and other debris that are extracted from automobiles, truck, buses and household appliances such as washers, dryers and refrigerators. The material is shredded and coated with an alkaline material that is designed to prevent metals from leaching out of the material. Only treated ASW can currently be disposed of in a lined landfill other than a Class I landfill. Much of the treated ASW going to landfills is used as ADC or for other beneficial reuses at the landfill. ASW used as ADC in California has increased from approximately 162,000 tons in 1998 to 632,000 tons in 2007 (see Table 3).

Staff with the Department of Toxics Substances Control have indicated that ASW treatment is not effective, the material should be considered hazardous, and ASW should be required to be disposed in Class I landfills. DTSC staff also indicate that ASW feedstocks are variable and have changed in the last 20 years (more electronic components, white goods, chlorinated plastics), sampling is costly, and it is difficult to obtain representative samples of ASW. Automobile Recycling Fluff in Ohio is considered unsuitable for ADC due to concerns regarding fire hazards, wind-driven scattering, dispersal outside the working face by landfill equipment, and the potential for contamination by asbestos, polychlorinated biphenyls (PCBs), and mercury (from switches).

The ASW generators were discussing the issues with DTSC when this paper was written, and a determination is pending in June. It should be noted that materials that cannot be disposed of in a landfill cannot be used as ADC. If ASW can no longer be disposed in a landfill, reference to its use as ADC should be removed from the regulations.

Option: CIWMB continues to monitor progress between DTSC and the ASW industry.

Draft Discussion
Attachment 1

State	<i>Approved ADC materials, demonstrations, fees, regulations</i>
Connecticut	<p>Approved ADC materials: polluted soil (i.e., contaminated soil); treated polluted soil; plastic membranes or tarps; sprayed on foams; sprayed on slurries; casting sands; incinerated sewage sludge ash; dredge spoils; etc.</p> <p>Department staff evaluates ADC on a case by case basis and requires applicant provide sufficient information (e.g., analytical test results, manufacturers information, etc.) for the intended ADC. Department staff have a working knowledge of Connecticut landfills and the subtleties associated with the operation and management of these facilities, which may mean that an ADC approved at one facility may not be appropriate for use at another facility. Factors that may affect the use of an ADC at a specific landfill include the following: personnel issues; equipment constraints; water quality problems; facility location; operational problems; etc.</p> <p>In situations where a new product or an unfamiliar waste is being proposed for use as an ADC, Department staff will request a field demonstration so that staff can evaluate its' effectiveness as a cover material, the manufacturers/generators assertions about the product/waste, the handling capabilities by landfill personnel and other associated problems that may occur during application procedures.</p> <p>Connecticut does not have specific regulations regarding ADC. 40 CFR Part 258 and scientific research are used as guidance in helping to evaluate potential materials for use as ADC.</p>
Idaho	<p>Chipped tires meeting size requirements, tarp-o-matic & posi-shell. The department is also considering auto shredder residue but hazardous waste staff have concerns about the industry analysis plan and whether the sample size is "representative" for the volume the facility generates.</p> <p>Site-specific demonstrations are not required, but the department has allowed 6-9 month demonstration projects prior to amending the facility's operations plan.</p> <p>ADC regulations are based on Title 40, Part 258 of the Code of Federal Regulations, Solid Waste Disposal Facility Criteria (Subtitle D)</p> <p>No major environmental issues reported with ADC.</p> <p>No diversion credit for ADC. http://www3.state.id.us/cgi-bin/newidst?sctid=390740013.K</p>
Indiana	<p>ADC material types: Altered tires, Wood chips, Compost, Foundry sand, Geotextile, Plastic tarpaulin, Dewatered publicly owned treatment works sludge, Dewatered paper sludge. Petroleum contaminated soil, Soil contaminated with vegetable oil, Material containing PCB allowed under 40 CFR 761.62(d), revised as of July 1, 1999, Material containing less than fifty (50) parts per million PCB that:</p> <p>(A) results from a source that contained less than fifty (50) parts per million PCB;</p> <p>(B) would otherwise meet the definition of PCB bulk product waste in 40 CFR 761.3, revised as of July 1, 1999*; and</p> <p>(C) is listed in 40 CFR 761.62(b)(1), revised as of July 1, 1999*.</p> <p>Other material containing less than or equal to ten (10) parts per million PCB not as a result of dilution</p> <p>Site specific demonstrations are sometimes required, particularly if Dept. staff is unfamiliar with the proposed material or had concerns how the material was going to perform as ADC. If a landfill wants to use other materials or waste not listed in the regulations, the landfill must submit proposal for our review and approval.</p> <p>No major health, safety or environmental problem caused by ADC.</p> <p>ADC is considered reuse.</p> <p>http://www.in.gov/legislative/iac/iac_title?iact=329 329 IAC 10-20-14.1</p>
Maryland	<p>ADC Materials: tarps, municipal incinerator ash, sewage sludge/soil mix, petroleum contaminated soil, auto shredder fluff, and Recovermat, a proprietary cover made of ground-up Construction and Demolition materials. A common condition is to cover with soil every week. Demonstration projects are often required, depending on well the operator documents request.</p>

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	<p>That depends on how well they documented their request, but it is common. For example, a 6 month trial was performed on auto shredder fluff and extended; operator was required to submit after-action reports describing pros and cons of the material.</p> <p>Research/studies on ADC: utilize Maryland regulations plus 40 CFR 258 where applicable. Incorporate both published research and site specific studies done as part of a demonstration by the requesters. This may include analytical data, such as material flammability studies on a request to use shredded C&D; wider variety of analytical studies included asbestos fiber analyses. The department also designed a test by having the operator build a bonfire and prove that they could put it out using their proposed cover material. It passed.</p> <p>Environmental issues: Nothing major but odor problems with some of the sludge-amended soils, and the C&D-derived cover did not suppress odors well. Improper use of the C&D material as a traction aide to slippery clay landfill access roads (not as cover) at one MLF also contributed to the development of hydrogen sulfide odors. ADC use is not included in recycling number of the state.</p> <p>http://www.dsd.state.md.us/comar/26/26.04.07.10.htm COMAR 26.04.07.10D</p>
Massachusetts	<p>ADC material types: Sand blast grit, C&D Fines, Aggregate, Short Paper Fiber, Mixed fill, Baghouse fines from asphalt batching plant, Freedman scrap wire casings, Sludge ash, WTP residuals, Pond sediments, Contaminated soil, Processed Glass Aggregate, Coal bottom ash, Spent biofilter compost, Dredged sediments, C&D Residual wood, Processed Fluorescent Glass</p> <p>ADC demonstration projects are sometimes required. Recently gave an approval for use of flue gas desulfurization residual as a demonstration/temporary approval.</p> <p>Environmental Issues: C&D fines as. In some instances , the use of this material as ADC has resulted in significant odors – hydrogen sulfide generation</p> <p>No diversion credit for ADC</p>
Michigan	<p>ADC Classifications <u>Class A:</u> certain manufactured materials (spray-on products, such as concover or topcoat) <u>Class B:</u> chipped tires, wood chips, ash from combustion of coal or wood, ground shingles and other material that do not contain friable asbestos, aluminum sludge from treatment of potable water at POTW’s, foundry sand, dredge spoils, paper mill sludge. At least 95% of material is retained on #200 sieve. <u>Class C:</u> Contaminated soil, from leaking underground storage tanks containing petroleum products, auto fluff, Class B materials that have less than 95% of material retained on a # 200 sieve, & other wastes approved by DEQ Director. Materials cannot contain hazardous constituents in concentrations exceeding criteria established by the Dept. of Environmental Quality Director</p> <p>One-year demonstration projects were allowed for Class C cover materials, but for the most part, are no longer required</p> <p>ADC safety regulations are based on inhalation concerns criteria</p> <p>No major ADC environmental issues reported.</p> <p>No diversion credit for ADC, as it is , it is still considered to be solid waste.</p> <p>http://www.deq.state.mi.us/documents/deq-wmd-swp-pt115rls.pdf http://www.michigan.gov/documents/deq/deq-whmd-opmemo-115-10_270074_7.pdf</p>
Minnesota	<p>No regulations on ADC.</p> <p>ADC materials: Soil and soil like waste materials. The majority of ADC is contaminated soils. Foundry sand and C&D fines are allowed if produced in the correct manner, which can only be used at C&D landfills and industrial landfills. The placement of new coal ash is counted as cover on older coal ash in coal ash monofills.</p> <p>No ADC demonstration projects are required.</p> <p>Environmental issue: Concern regarding C&D fines. There is a statute prohibiting its use in MSW landfill and drywall must be removed prior to processing and the waste cannot be ground. https://www.revisor.leg.state.mn.us/statutes/?id=115A.936</p> <p>No diversion credit for ADC. The state levies a solid waste management tax on disposal, and ADC is exempt from the tax.</p>

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<p>Missouri</p>	<p>ADC Materials: Tarps/geotextiles, Tire chips/soil (50/50 mixture), Fly ash/bottom ash mixture (up to 50% bottom ash), Spray-applied (Topcoat and similar products; Posi-shell), Petroleum contaminated soil, Other types of contaminated soil, Woods chips/soil (50/50 mixture) Virgin coal/soil (50/50 mixture), Foundry sand/soil (50/50 mixture)</p> <p>New materials are sometimes approved as pilot projects for a specified period of time. Regional office inspectors observe material at landfill and determine whether to approve it on a continuing basis.</p> <p>No major environmental issues except a few odor and litter problems.</p> <p>ADC is not considered diversion. Tonnage fee is charged on all disposed material, including material used as ADC (tarps and spray-applied excluded)</p>
<p>Nebraska</p>	<p>ADC materials: wood chips/soil mixture, petroleum contaminated soil, slag, auto fluff, tire shreds/chips, 4 mil polyethylene plastic tarp, cob ash, 60 mil tarp, foundry sand, commercial spray-on cover</p> <p>Operators must perform demonstration projects that generally last 180 days to allow for evaluation of the proposed ADC under differing climatic conditions. A plan for conducting an ADC demonstration must be submitted for review and approval prior to initiating the demonstration.</p> <p>ADC is not counted as disposal and the state does not charge the \$1.25/ton disposal fee for ADC. Landfills collect a fee for managing these materials as ADC.</p> <p>http://www.deq.state.ne.us/Publica.nsf/0/7f4334a7967c778086256870007d01d0/\$FILE/06-222.pdf</p>
<p>New York</p>	<p>No list of approved materials. Regional offices pre-approve ADC materials. Petroleum-contaminated soils are major ADC use. Also use MSW/Wood Ash, Aggregate/Concrete/Glass, Processed C&D, Soil (Clean), POTW Incinerator Ash, Paper Mill Sludge, Industrial Waste, Plattco Sand, Shredder Fluff, Wood/Wood Chips, Industrial Waste, Foundry Sand, Powdered Glass, Sewage Sludge, Tire Chips</p> <p>Demonstration projects are not usually required.</p> <p>Environmental issues: Some landfill have had complications with the use of processed C&D which has contributed to the generation of noxious odors (H2S generation via decomposition of gypsum wall board).</p> <p>No diversion credit for ADC.</p> <p>http://www.dec.ny.gov/regs/14639.html</p> <p>http://www.dec.ny.gov/regs/4400.html</p>
<p>Ohio</p>	<p>ADC materials: Slurries, tarps, contaminated soil, foundry sand, coal combustion bottom ash, slag, and certain industrial residuals such as filter cakes.</p> <p>The director may approve solid waste or alternative materials for daily cover. The owner or operator must obtain written approval to use an alternative material or thickness for daily cover prior to utilizing the alternative material or thickness.</p> <p>Demonstration projects are required. If an operator has experience with a tarp-type ADC, the state will probably not require another trial period for another tarp.</p> <p>Environmental issues: No major issues beyond general inadequacies that occur from time to time.</p> <p>Ohio EPA considers the following materials unsuitable for ADC use:</p> <ul style="list-style-type: none"> ... Tires - due to significant potential as fire hazard ... Fly Ash - due to significant potential for dust ... Automobile Recycling Fluff - due to concerns regarding fire hazards, wind-driven scattering, dispersal outside the working face by landfill equipment, and the potential for contamination by asbestos, polychlorinated biphenyls (PCBs), and mercury (from switches). ... C&D fines - due to significant potential for dust and asbestos fibers <p>No diversion credit for ADC.</p> <p>http://www.epa.state.oh.us/dsiwm/document/currentrule/3745-27-19_current.pdf paragraph (F)</p> <p>Internal operating procedure for processing ADC requests: http://www.epa.state.oh.us/dsiwm/document/guidance/gd_654.pdf</p>

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<p>Oregon</p>	<p>ADC materials: Includes commercial products such as geosynthetic tarps, and indigenous waste materials such as paper sludge, auto shredder fluff, and spent refractory (alumina brick).</p> <p>Department of Environmental Quality approves ADC on a case-by-case basis. All requests for ADC approval require a trial period of ADC use and evaluation to demonstrate the ADC is as protective as earthen daily cover material.</p> <p>Approved ADC is exempt from the per-ton solid waste disposal fee as long as quantity of ADC used is equivalent to six inches of earthen material per 40 CFR Part 258.21. Quantities of ADC waste placed on or in the landfill in excess of the amount needed to provide the equivalent of six inches of daily soil cover are subject to all applicable fees.</p>
<p>Rhode Island</p>	<p>ADC materials: C&D screenings, Auto shredder residue, Dredge spoils, contaminated soil, Incinerator Ash, Slag and Foundry sand , Recovermat (patent process that produces ground C&D waste) and posi-shell. These types of ADC are only permitted at a lined landfill known as central landfill. RI has only 2 active landfills</p> <p>Demonstration projects required. Recovermat has undergone 3 months pilot test to demonstrate its efficiency.</p> <p>Environmental issues: Landfill gas odor problems. Some ADC materials are more porous than soil causing fugitive emissions. Minimizing the use of soil may contribute to the problem. Air Monitoring reports show low levels of contaminants on-site and at the boundary line. Active gas system exist at this landfill.</p> <p>ADC is considered diversion because it supplements the use of soil and has market value.</p>
<p>South Carolina</p>	<p>ADC materials: Site-specific, case-by-case basis. No list of pre-approved materials. State has allowed automobile shredder fluff, mixtures of wood-waste and soil (50-50 mix) some types of commercial sprays such as top-coat, and tarps</p> <p>Demonstration projects: State grants a six month trial period to a specific user before approving long term. Approval is based on the consideration of the cover's performance and performance of the facility using the material.</p> <p>Environmental issues: none reported</p> <p>No diversion credit for ADC.</p> <p>http://www.scdhec.gov/environment/lwm/regs/R61-107-19.pdf</p>
<p>Utah</p>	<p>Approved ADC materials: non-hazardous contaminated soil, tarps, plastic sheets, foam products, products created from cement kiln dust, incinerator ash, non-hazardous auto shredder residue not otherwise regulated by 40 CFR Part 761, chipped waste tires, and spray-on materials.</p> <p>No site-specific demonstration projects are required. No major environmental issues reported. No diversion credit for ADC.</p> <p>http://www.hazardouswaste.utah.gov/Rules/Adobe/SWRules/R315-303_eff.pdf R315-303-4(4)</p>
<p>Washington State</p>	<p>Alternative materials of an alternative thickness other than at least six inches (15 centimeters) of earthen material may be approved by the jurisdictional health department if the owner or operator demonstrates during the permit process of WAC 173-351-700 that the alternative material and thickness control disease vectors, fires, odors, blowing litter, provides adequate access for heavy vehicles, will not adversely affect gas or leachate composition and controls and scavenging without presenting a threat to human health and the environment.</p>
<p>Wisconsin</p>	<p>Commonly used ADC materials: foundry sand, auto shredder fluff, some papermill sludges, contaminated soils bottom ash and slag.</p> <p>ADC demonstration projects used to be required several years ago, but are not required now once the department became familiar with how ADC material types performed.</p> <p>The department bases decisions on physical ability of the proposed ADC to act like a granular soil and perform well in wet weather. Do not allow fly ash, air pollution control dusts, and filter cakes as ADC. The department has occasionally restricted ADC use to interior slopes so that any runoff stays in the waste mass or leachate collection system to prevent offsite impacts due to contaminated runoff.</p> <p>No major environmental issues with ADC.</p> <p>ADC is exempt from statutory tipping fees, currently at \$5.897/ton. That leads to some abuse, as waste company sales agents sell disposal services for ADC materials without pricing in the tipping fees. Some sites have taken far more ADC materials than they can use, and department rules do not specify that an operator can only use the amount of ADC that substitutes for soil. http://www.legis.state.wi.us/rsb/code/nr/nr506.pdf</p>

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Wyoming	<p>Approved ADC is any cover including no less than six (6) inches of compacted soil or any alternative material approved by the administrator to adequately control infiltration, disease vectors, fires, odors, blowing litter, and scavenging</p> <p>For balefills, no less than six (6) inches of compacted soil, or any alternative material approved by the administrator to adequately control disease vectors, fires, odors, blowing litter, and scavenging, applied to the top and sides of an active balefill disposal area; balefill operations shall not be required to cover the vertical working face of the balefill facility, unless required by the administrator to control litter, fire, odor, disease vectors, or scavenging. At any facility where an alternate daily routine cover material has been approved for use by the administrator, the owner or operator shall adequately compact all wastes and apply no less than six (6) inches of compacted soil at least once every thirty (30) calendar days, as a fire control measure.</p> <p>Tarps, commercially produced spray-on products, shredded scrap tires/cover soil mix are examples of approved materials. Department sometimes requires “pilot tests” before approving full use of an alternate cover.</p> <p>Environmental issues: Improper application by landfill operators; especially spray-on varieties.</p> <p>ADC does not count as diversion or recycling.</p> <p>http://deq.state.wy.us/shwd/SW/SWRules_z03.asp</p>
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