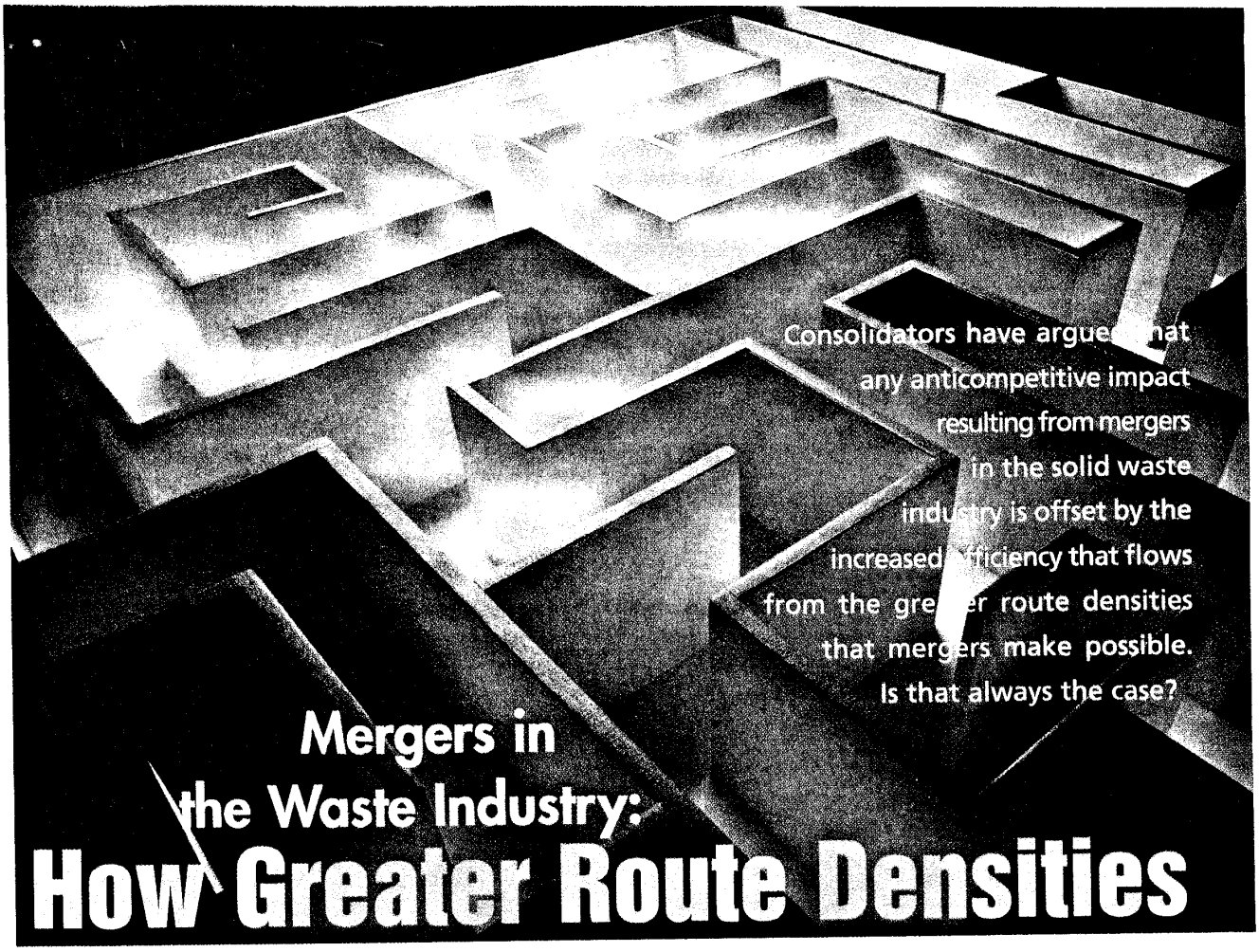


Mergers in the Waste Industry: How Greater Route Densities Impact Collection Efficiency

By Peter Anderson

Twenty-eight years of consolidation have culminated in announcements of megamergers by third-ranked USA Waste Services and first-ranked Waste Management in 1998 and then of fourth-ranked Allied Waste Industries and second-ranked Browning-Ferris Industries (BFI) in 1999. In the opinion of one leading investment analyst, consolidation could wind down by 2001 because there are so few large independents left, and those are generally not acquirable because of liabilities.[1] The endgame is upon us.

This trend has raised concerns that significant anticompetitive conditions might ensue in many geographic markets. The question has been raised in markets where evergreen contracts, price discrimination, or strategic acquisition practices by dominant firms have erected resilient barriers to entry by new haulers. Notable concern has arisen where large merging firms control all the local landfills—a bottleneck in the solid waste industry—creating near insurmountable barriers against new competitors.

Under the antitrust statutes in the United States, the Department of Justice or the Federal Trade Commission reviews these mergers to determine whether the effect of the combination might be to substantially lessen competition or to create a monopoly. The underlying issue in merger reviews is whether the combination will reduce competition sufficiently such that there is a significant likelihood the merged firm, acting alone or with others, will be able to exercise market power in the relevant market.

If the high market concentration created by a merger raises competitive issues, antitrust officials will also consider whether the possibility of new entrants attracted by monopoly rents will overcome those anticompetitive forces or whether these concerns might be outweighed by merger-specific economic efficiencies that result from the combination.

In the case of the solid waste industry, consolidators have argued that any anticompetitive impact resulting from mergers is offset by the increased efficiency that flows from the greater route densities that the merger makes possible.

However, this issue is somewhat narrower in that route densities can only improve when certain types of collection operations are combined, namely nonfranchised residential and commercial collection. It does not pertain to franchised collection because the franchise provides 100%

coverage of the targeted market within the franchise area. Nor, it must be emphasized, does this potential advantage for hauling imply that there will be efficiency advantages in the disposal side of the operations when two waste firms combine their landfill and related assets in a region. No one has yet propounded any case for disposal efficiencies, and none is immediately evident.

But with regard to nonfranchised residential or commercial collection, it is conceptually true that greater route densities may lead to improved efficiency. This can occur because in competitive markets, many haulers may run their trucks down the same street with, for example, one hauler collecting from the first and third establishment on the block, another hauler from the second and fourth establishment, and so on. Consequently, each truck will dissipate part of its time driving by establishments that are customers of competing haulers, with the result that the time between each stop will be longer.

The extent of these potential efficiency improvements, however, needs to be carefully computed before any specific level of importance can be attached to it. As stated by the Justice Department: "Efficiency claims will not be considered if they are vague or speculative or otherwise cannot be verified by reasonable means."[2] The purpose of this analysis is to calculate this efficiency claim.

If a verifiable analysis establishes that these gains exist, then the prospect that the improvement will be realized and (if realized) reflected in lower prices needs to be evaluated to warrant giving it consideration as an offset to losses in competition. That is to say that the possibility of improved collection efficiencies from greater route densities that flow from consolidation creates its own set of impediments to competition. It means that to succeed, a new entrant will not only need capital to purchase a few packer trucks, but also to operate at a loss until it builds a customer base with route densities similar to those of the dominant consolidator. In addition, of course, the higher market concentration ratios implied by those densities can create a dominant firm with market power.

Analysis

Unfortunately, it is difficult to assign a single value to the potential for efficiency gains because, among other things—including the extent to which the two merging firms' customers neatly mesh—the answer is very sensitive to local conditions. Two of the primary factors that will vary from region to region, and even from route to route, are:

1. The time to set up *at* each stop (including driving into and out of the site, opening and closing any gates, lining up the containers, and cycling the load) and
2. The time *between* stops.

It is the time between stops that defines the cost component that most improves when route density increases. However, at the same time, it must be recognized that 30-40% of the operators' day is spent going to and from the route, offloading, and taking breaks. And depending on route densities, as much or twice as much time will be spent at the stop as between stops, and that time is not affected by higher densities. Also, approximately one-third of the total haul cost is associated with tipping fees at the landfill. Since neither the time spent away from collection nor the time spent at each stop—not to mention the charges at the landfill—directly changes with greater route densities, the overall efficiency gains from those higher densities are significantly dampened.

To supply an answer that can be applied across a variety of different local conditions, Table 1 provides a sensitivity analysis as a function of the two factors identified above. Although this will not provide an answer for every particular situation, it will provide a framework to undertake these evaluations in the future, and it will lay out the answers in representative situations not unlike the case in most regions of the country.

Because solid waste collection costs are nonlinear, discretely modeling each assumption is required. *Step functions* are used to track the way in which waste-handling systems operate in the real world. With step functions, an effect does not arise with each increment in a causative event. Rather, some threshold level of that cause must first be reached before the effect occurs.

To illustrate, the primary step function in waste handling relates to the fact that when the collection vehicle tops out, it must go off-route, typically for more than an hour, to offload. Until that point is reached, however, no time is lost for tipping. On a given route, it is the particular relationship of truck capacity, packing ratio, pickup rates, quantities set out, hours worked, and time to the landfill that, in turn, determines how soon the truck fills up, leaves the route to unload, and then returns to continue collection.

The general assumptions used are as follows: a $105,000 purchase cost for a 25-yd. rearloader that achieves a 5:1 packing ratio; one operator earning $20/hour in wages and benefits, working 7.5 effective hours in a nine-hour day, collecting solid waste with a 200-lb./yd.^{3} density, and unloading one-hour roundtrip from the route at a facility with a $30/ton tip fee; and a 23% overall return on investment on the vehicle and containers before taxes. The resulting calculation, which was done for a 2-yd. container collected twice weekly, estimates the haul charge across the range of possible scenarios.[3]

If the resulting plots for the different "minutes between stops" on this table are linear for a given "minutes to set up," then it will be possible to use these values to estimate overall costs under a variety of other conditions that may occur under various types of mergers, at least so long as the extrapolation is within or reasonably close to the boundary conditions specified in Table 1.

That this is the case is shown by a calculation of a best fitting line for

TABLE 1. Monthly Cost of Commercial Collection
(2-yd. container twice weekly)

		Minutes Between Stop				Percent Difference		
		1	2	3	4	(4:1)	(4:2)	(4:3)
Minutes to Set Up	5	$93	$100	$116	$124	-25.0%	-19.4%	-6.5%
	6	$100	$116	$124	$132	-24.2%	-12.1%	-6.1%
	7	$116	$124	$132	$139	-16.5%	-10.8%	-5.0%
	8	$124	$132	$139	$147	-15.6%	-10.2%	-5.4%

TABLE 2. Linear Regression for Each Time at Stop

Time at Stop	Regression*	R^2
5 Minutes	y = 81 + 10.9x	0.98
6 Minutes	y = 92 + 10.4x	0.97
7 Minutes	y = 108.5 + 7.7x	0.99
8 Minutes	y = 116.5 + 7.6x	0.99

* "x" *is time between stops;* "y" *is costs*

TABLE 5. Impact of Hypothetical Mergers on HHI

	Before	After	Incr.	%
National/Independent	2,500	2,900	400	16%
National/Regional	2,500	4,100	1,600	64%
National/National	3,300	6,500	3,200	97%

are considered unconcentrated; between 1,000 and 1,800, moderately concentrated; and above 1,800, highly concentrated. General standards are then laid out for how each stratum shall be considered as part of a merger review when the postmerger HHI falls in each region.[2]

In the market relationships hypothesized here—which are common in the MSW industry in most regions today—the premerger HHI values are already in the range considered to be highly concentrated. In any event, regarding a postmerger HHI above 1,800, the *Guidelines* states: "The Agency regards markets in this region to be highly concentrated. Mergers producing an increase in the HHI of less than 50 points, even in highly concentrated markets post-merger, are unlikely to have adverse competitive consequences and ordinarily require no further analysis. Mergers producing an increase in the HHI of more than 50 points in highly concentrated markets post-merger potentially raise significant competitive concerns.... Where the post-merger HHI exceeds 1,800, it will be presumed that mergers producing an increase in the HHI of more than 100 points are likely to create or enhance market power or facilitate its exercise...."[2]

As shown in Table 5, here the HHI point increase is from 400 to 3,200—depending on whether the combination is of a national with an independent, a regional, or another national—which is outside the 50-point perimeter established by the Justice Department.

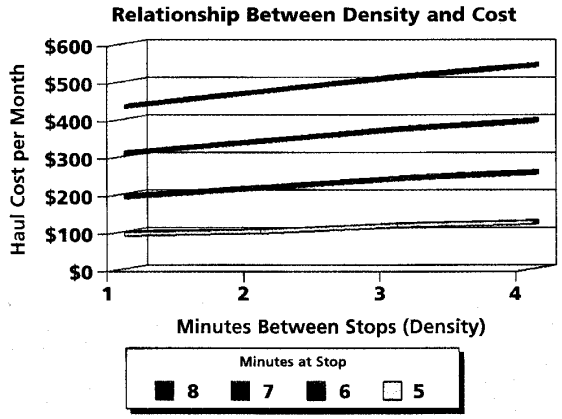
Figure 2 brings together data from Tables 4 and 5 to show the relationship between efficiency gains as a percent of HHI point increases for the three scenarios considered, namely the merger of a national with an independent, a regional, and another national consolidator.[7] As can be seen, the negative impacts from consolidation (in the form of increased HHI points) increase exponentially for very small increments of efficiency gains.

Conclusions

Essentially, the solid waste industry as depicted in the scenarios in this article is already so highly concentrated that the postmerger HHI from almost any merger would seem to contravene the Justice Department's general guidelines. Moreover, only in the case of the largest mergers, illustrated by the combination of two major firms each with 40% market share, are the collection efficiencies really substantial.

However, at that level of combination, the HHI measure of market concentration would approach 6,500—more than three times the 1,800 level at which the Justice Department considers the market to be highly concentrated. That is to say that in order to see significant efficiency gains, the combination would have to impose an unacceptable threat to competition. As such, any realized gains cannot be expected to be shared with the consumer.

FIGURE 1. Commercial Collection Costs



estimate the total time per stop on a route.

The average time between stops for the expanded market share after acquiring a small firm of 45% would work out to 4.44 minutes; after acquiring a regional and realizing a 60% share, 3.33 minutes; and after acquiring another national making an 80% share, 2.50 minutes.

To convert these reductions in the time between stops to overall operational costs, we used the regression equations for each "time at stop" shown in Table 2 for each hypothetical "time at stop." The results show how the overall cost to collect solid waste from the hypothetical commercial customer varies as route densities increase in the form of shorter times between stops (namely, from five minutes with the base 40% market share to 4.44 minutes with 45% share, 3.34 minutes with 60% share, and 2.50 minutes with 80% share), as shown in Table 4.

Application of Results

Table 4 shows varying potential for efficiency improvement through greater route densities made possible by mergers. Under the range of hypothetical mergers evaluated here, the cost savings extend from approximately 3% to 20%, with the median case in the order of 10%.

However, the simple fact that some of the scenarios suggest that there is a theoretical potential for significant efficiency gains (e.g., those that are in excess of 10%) is not, by itself, sufficient to justify a merger.

For one thing, there is a substantial body of empirical analysis that has found that businesses without competitive pressures suffer from what has been coined "X-inefficiencies," or the desire to live the comfortable life. Undoubtedly, investor pressures to improve earnings while USA Waste Services struggles to absorb Waste Management's assets, as well as with Allied and BFI, will goad managers to aggressively streamline routes. However, in the future, if profit-maximizing oligopoly pricing follows, X-inefficiencies may arise throughout the systems. This would need to be considered.

In addition, it has been empirically established that, at some point, the market power derived from very high-concentration ratios resulting from mergers makes it possible for the merged firm to capture any gains instead of sharing them with the consumer. As stated in the Justice Department's *Horizontal Merger Guidelines*,[2]

> "Competition usually spurs firms to achieve efficiencies internally. Nevertheless, mergers have the potential to generate significant efficiencies by permitting a better utilization of existing assets, enabling the combined firm to achieve lower costs in producing a given quantity and quality than either firm could have achieved without the proposed transaction. Indeed, the primary benefit of mergers to the economy is their potential to generate such efficiencies....
>
> "Even when efficiencies generated through merger enhance a firm's ability to compete, however, a merger may have other effects that may lessen competition and ultimately may make the merger anticompetitive....
>
> "The Agency will not challenge a merger if cognizable efficiencies are of a character and magnitude such that the merger is not likely to be anticompetitive in any relevant market.... To make the requisite determination, the Agency considers whether cognizable efficiencies likely would be sufficient to reverse the merger's potential to harm consumers in the relevant market, e.g., by preventing price increases in that market. In conducting this analysis...the Agency will not simply compare the magnitude of the cognizable efficiencies with the magnitude of the likely harm to competition absent the efficiencies. The greater the potential adverse competitive effect of a merger...the greater must be cognizable efficiencies in order for the Agency to conclude that the merger will not have an anticompetitive effect in the relevant market. When the potential adverse competitive effect of a merger is likely to be particularly large, extraordinarily great cognizable efficiencies would be necessary to prevent the merger from being anticompetitive.
>
> "In the Agency's experience, efficiencies are most likely to make a difference in merger analysis when the likely adverse competitive effects, absent the efficiencies, are not great. Efficiencies almost never justify a merger to monopoly or near-monopoly."

There are several measuring sticks used by economists to evaluate the extent to which market concentration affects competition. The Herfinahl-Hirschman Index[5] (HHI) is the one used by the Justice Department because of, in part, its ability to reflect the disproportionately greater impacts of larger firms on competitive interactions.

TABLE 4. Relationship Between Cost and Improved Densities
($/Customer/Month)

Time at Stop	Before and After Market Shares Following Mergers			
	Before (40%)	After (45%) National/ Independent	After (60%) National Independent	After (80%) National/ National
5 Minutes	$135.50	$129.40	$117.30	$108.25
% Gain	n/a	4.5%	13.4%	20.1%
6 Minutes	$144.00	$138.18	$126.63	$118.00
% Gain	n/a	4.0%	12.1%	18.1%
7 Minutes	$147.00	$142.69	$134.14	$127.75
% Gain	n/a	2.9%	8.7%	13.1%
8 Minutes	$154.50	$150.24	$141.81	$135.50
% Gain	n/a	2.8%	8.2%	12.3%

Table 5 shows the HHI values before and after the postulated mergers in the three scenarios evaluated in this paper, namely a merger of a national firm with, first, an independent; second, a regional; and third, another national. It also shows the point difference between the before and after values, as well as the percent change.[6]

According to the *Horizontal Merger Guidelines*, HHI values below 1,000

the data points from Table 1 using the regression analysis set forth in Table 2, as reflected in the R^2 values for the equations (a statistical measure of goodness of fit) that turn out to be very close to 1 (which describes a perfect fit along a straight line). Figure 1 plots the data for each "minutes to set up" on a graph, also showing them as very close to straight lines.

In order to provide a general assessment of the typical improvement in a merger, we postulate a national consolidator with 40% haul market share in a local geographic market. In the first scenario it acquires a small private hauler with 5% market share; in the second, a regional publicly traded firm with a 20% market share; and in the third, another national publicly traded company with an equal 40% market share. The resulting market shares for each scenario, then, would rise to 45%, 60%, and 80%, respectively.

Table 3 shows the relative market shares under each assumption before and after the mergers for the merging firms, as well as the nonmerging firms, with the shares shown in italics representing the firms that are merging.

The question for the claim that there are significant efficiency gains can be simplified to how much the time between stops is reduced as the resulting route densities improve. In the case where the initial time between each potential customer is two minutes, the consolidator with a 40% share would average five minutes between the commercial establishments that have signed up as customers.[4] To that would have to be added the time at each stop—perhaps five, six, seven, or eight minutes—to

TABLE 3. Hypothetical Market Shares Under Each Scenario

National/ Independent	Before	*40%*	20%	20%	5%	5%	5%	5%
	After	*45%*	20%	20%	5%	5%	5%	
National/ Regional	Before	*40%*	*20%*	20%	5%	5%	5%	5%
	After	*60%*	5%	20%	5%	5%	5%	
National/ National	Before	*40%*	*40%*	5%	5%	5%	5%	
	After	*80%*	5%	5%	5%	5%		