Zoning-Related Density as a Lens for IOS Investment

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Industrial outdoor storage (IOS) is an alternative property sector that serves ancillary functions to the broader logistics ecosystem. Examples of IOS properties include contractor yards, tractor-trailer parking, freight container yards, heavy equipment rental parking, and fleet maintenance facilities. The uses for IOS can be highly fungible, which makes categorizing the property type tricky. As we write, a NCREIF subcommittee is working to determine how to categorize a property sector that has become a hot topic.

Even without a formalized definition of IOS, investors' interest is piqued. Since the pandemic, at least $5 billion of flows cumulatively have been tracked into investment vehicles targeting the sector. It is advertised as having a high degree of noninstitutional ownership, while also offering income yields exceeding those of traditional core warehouses without much in the way of capital expenditure. Those are very desirable investment characteristics.

From a property data standpoint, however, IOS is opaque. Vacancy and rent metrics are not readily available for those who do not already own sizable IOS portfolios. Crucially, IOS is supply-constrained because of land-use regulations. Users generally need space proximate to urban cores, where economic activity is concentrated and undeveloped plots tend to be scarce. It also does not help that IOS uses tend to be aesthetically challenged. Few enjoy looking out upon piles of building materials or rows of idle tractor trailers.

IOS combines informational opacity with supply constraints and limited ability to absorb capital expenditure. Its utility comes from its being land. As an alternative property sector, we expect IOS to exhibit price volatility, especially during the early phase of investor discovery and adoption. In this era of "too much money, too few assets," the potential for dramatic fluctuations in valuations with IOS is a major risk managers tasked with client capital stewardship face (aka above all, do not lose principal).

Toward an Analytical Framework for Investing in IOS

Like the sector itself, much of what real estate generalists know about IOS is anecdotal and fragmented. To understand IOS within a geography requires dedicated acquisitions professionals willing to canvass the area to accumulate knowledge and build requisite relationships with local market participants. Complicating efforts around data collection, however, is the determination of how to standardize vacancy and/or rent measurements when the use cases for IOS are fungible. Is vacancy for fleet parking the same as vacancy for heavy machinery parking, and how is that measured? Are the rents the same, and if not, how frequently can the uses be expected to change? Sophisticated owners will figure this out, but ultimately, tracking conventional measures of property performance may not be the most relevant to investment performance.

Rather, why not approach the selection process using measures of zoning-related density? Remember that this is one of the cornerstones of IOS fundamentals. Zoning creates scarcity because IOS tends not to be the "best and highest use." People often associate urban cores with visible signs of density: snarled traffic, high-rise residential buildings, and a lack of green or open space. But zoning-related density can be different. Across many metro areas, considerable land is protected by zoning laws that prevent any type of commercial or even residential development. Those constraints on land use, while artificial, are every bit as determinant to the overall availability—and consequently, pricing—of land used for IOS.

Zoning-Related Density

Understanding that regulatory restriction on land use is a primary—if not the primary—determinant of overall

Exhibit 1: Zoning Density by County

	Population and Area			Density (Higher = Denser)		
	(a)	(b)	(c)	(d)	(e)	(f)
County	Population (in Thousands)	Total Acreage (in Thousands)	Nonresidential Zoned Acreage (in Thousands)	People per Acre (PPA) of Zoned and Unzoned Land	PPA of Zoned Nonresidential	PPA of Zoned IOS Allowed
Los Angeles	9,841	2,591	205	6.0	48.0	61.8
Maricopa	4,519	5,852	92	2.6	49.1	67.7
Riverside	2,435	4,600	157	1.7	15.5	19.1

Sources: National Zoning Atlas, IPA Research as of Sept. 2025

availability of IOS and therefore a critical determinant on pricing, we set out to find a way to better understand the level of land-use restriction different markets face across the country.

Enter the National Zoning Atlas (NZA)—a Geographic Information System–based compendium of zoning districts across 33,000 US jurisdictions. The site is thoughtful, well-executed, and free to use.[1]

The NZA tracks zoning districts at the county and municipal levels, categorizing parcels into one of four aggregate designations: primary residential, mixed-use residential, protected/tribal, and unzoned. We created measures of density based upon people per acre of zoned land. To manage the analytical work involved in this project, we assessed zoning-related density only at the county level.

Our analysis compares three counties that represent the primary and most populous counties within three different metro areas: Los Angeles County for the Los Angeles–Long Beach–Anaheim metropolitan statistical area (MSA), Riverside County for the Riverside–San Bernardino–Ontario MSA, and Maricopa County for the Phoenix–Mesa–Chandler MSA.

In Exhibit 1, column (d) is the most general measure of density: people per acre (PPA) of zoned and unzoned land. We include currently unzoned land, assuming that eventually it will be zoned as economic activity and population continue to expand. By this measure, Los Angeles is far denser at 6.0 PPA than either Maricopa or Riverside. Just comparing satellite imagery maps of these places validates the numbers in column (d). That said, when zoning density specific to IOS is taken into consideration—whether the PPA of zoned nonresidential (e) or the PPA of zoned IOS allowed (f)—Maricopa's zoning-related density exceeds that of Los Angeles: a 67.7 PPA for Maricopa versus a 61.8 PPA for Los Angeles. We assume that IOS uses are not permitted in primary or mixed-use residential districts. We calculated the PPA of zoned IOS using NZA's granular zoning district data, accounting for those districts where IOS uses are explicitly allowed.

Selecting Markets for Analysis

We selected Los Angeles, Maricopa, and Riverside counties because these three metro areas have relatively deep transactional time series data for IOS and IOS-adjacent properties (i.e., truck terminals) over the January 2016 to June 2025 time frame. We found it necessary to include truck terminal sales selectively. Truck terminals are supply chain nodes that allow freight to be efficiently unloaded from one transport vehicle to another rather than being unloaded into a warehouse, stored, and then reloaded onto another vehicle. Though investors do distinguish between truck terminals and IOS, many sizable IOS portfolios often include truck terminals.

To generate Exhibits 2, 3, and 4, we created a repeat sales index, using CoStar, to capture cumulative price appreciation between the first and last sale of the IOS property over that time frame, regardless of how many times the property was traded. As mentioned, we also queried for truck terminals with a floor area ratio below 0.2 to augment the sample size. Cumulative change in price for a given property (vertical axis) was then

1. "Digitizing, Demystifying, & Democratizing the Country's Zoning Codes," National Zoning Atlas.

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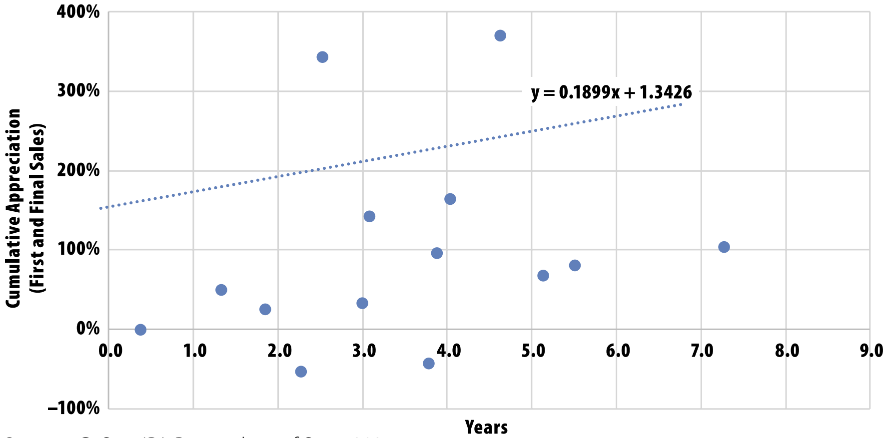
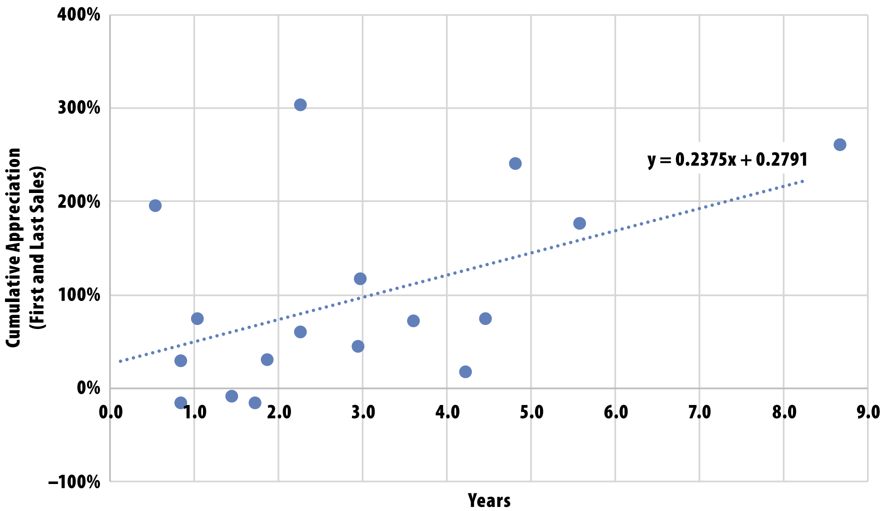
Exhibit 2: Los Angeles County IOS / IOS-Adjacent Property Sales 2016–2025



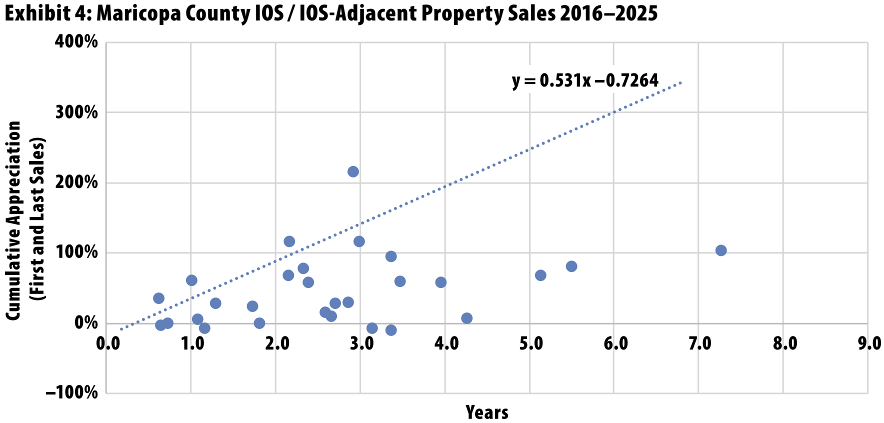
Sources: CoStar, IPA Research as of Sept. 2025

Exhibit 3: Riverside County IOS / IOS-Adjacent Property Sales 2016–2025



Sources: CoStar, IPA Research as of Sept. 2025

Exhibit 4: Maricopa County IOS / IOS-Adjacent Property Sales 2016–2025



Sources: CoStar, IPA Research as of Sept. 2025

plotted against the number of years between the first and last sales (horizontal axis).

Using the least squares method to draw a best-fit straight line for each scatterplot reveals that the regression coefficient, or the slope, of the line for Maricopa County (0.531, Exhibit 4) is much steeper than the regression coefficients for Los Angeles (0.190, Exhibit 2) and Riverside (0.238, Exhibit 3). What does this mean? We surmise that the greater the zoning-related density of a market—in this case, Maricopa County—the faster price appreciation should occur. When investors grasp how scarce IOS is within a certain geography, they will bid up prices faster to some equilibrium level than they would in areas where IOS is less scarce. What we did not expect before we began this analysis was that Phoenix IOS would see faster price appreciation than Los Angeles or Riverside. When it comes to the conventional warehouse, Riverside warehouse property price appreciation from 2016 to 2025 has outpaced that of both Los Angeles and Phoenix, according to RCA's Commercial Property Price Index.

Just the First Step

We are at the beginning in developing an analytical framework for IOS investment. The scarcity of transactional



data around sales of IOS properties is one of the primary challenges to this analysis. Additionally, our approach with its singular focus on zoning-related density ignores other determinants of property performance that could be far more meaningful—and/or idiosyncratic. Price trends in emergent property sectors are often driven more by capital flows than by fundamentals. Fortunately, despite the curiosity that IOS solicits, we have yet to witness a flood of "hot money" into the sector.

Thus far, what we have uncovered should encourage anyone seeking an accessible, quantitative framework for an IOS investment strategy. The niche sector investment playbook usually involves finding the right operational partner. But investors should not be completely dependent upon anecdotal market information. Research is often about demystifying informationally opaque topics with the goal of refining investment theses, especially with respect to market risk.

An operating partner who has invested time and energy in understanding local IOS market dynamics should be able to fill in sparse transactional data. We analyzed additional markets, but we soon realized the data collected was insufficient for even cursory statistical analysis. As the IOS sector attracts further investment, data availability will improve, though it will tend to favor those who have accumulated scale within the sector.

We plan to extend our analysis to additional geographies across the country.[2] We will likely have to combine counties and MSAs to create sufficiently robust sample sizes for analysis. The inclusion of smaller and more-regional industrial markets across the country will be a more fulsome test as to whether zoning-related density is indeed a practical lens through which to view IOS investment. ■

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