MEMORANDUM

Date: February 12, 2018

To: Members of the Investment Committee
California Public Employees' Retirement System ("CalPERS")

From: Meketa Investment Group ("Meketa")

Re: Semi-Annual Infrastructure Performance Review
as of December 31, 2017

In our role as the Board Infrastructure Consultant, Meketa conducted a semi-annual performance review of the Infrastructure Program ("the Program") based on data provided in Wilshire's CalPERS Real Assets Performance Analysis Review for the period ended December 31, 2017, and selected CalPERS reports as cited. This memorandum provides the Program performance data and information on key parameters, along with summary market commentary. It also transmits a follow-up item from the November 2017 Annual Performance Review ("APR"): additional commentary on the Real Asset Unit's organizational structure and staffing as it relates to the Program.

Program Performance[1]

CalPERS' Infrastructure Program continues to significantly outperform its policy benchmark for the reporting period, and over all other trailing periods shown below. These returns notably reflect an increase over the marks as at the last semi-annual reporting period, both on an absolute and benchmark-relative basis; Program performance for the period ending June 30, 2017 also exceeded the benchmark for all trailing periods, both on an absolute and benchmark-relative basis.

Net Returns %	Qtr.	6 mos.	1 year	3 year	5 year	10 year
Infrastructure Program	8.2	12.5	18.2	12.4	14.3	13.3
Benchmark CPI+ 400	1.8	3.2	6.3	5.3	5.3	6.2
Over (under) Performance	6.4	9.3	11.9	7.1	9.0	7.1

The Program also has outperformed its expected annual return of 7.0% established in the currently effective Capital Market Assumptions (2013) under the Asset Liability Management process.

[1] Per Wilshire's CalPERS Real Assets Performance Analysis Review for the period ended December 31, 2017, reported with a 1-quarter lag, so effectively as of September 30, 2017.

Key Parameters[1]

Meketa evaluated the Program across six key parameters, with the following conclusions.

- **Implementation:** The Program's Net Asset Value ("NAV") as at September 30, 2017, was $4.03 billion, an increase of $355 million, or 10%, compared to the December 31, 2016, NAV of $3.67 billion. The current NAV represents 1.2% of the total Fund, compared to the 1% Interim Target.[2]
- **Risk:** NAVs are distributed across the Core, Value-Add, and Opportunistic risk classifications at 70%, 17%, and 13%, respectively, which are compliant with policy ranges.[3]
- **Region:** NAVs are distributed across the U.S., International-Developed, and International-Developing geographies at 51%, 48%, and 1%, respectively, which are compliant with policy ranges.[3]
- **Leverage:** The Program's Loan to Value ("LTV") metric and Debt Service Coverage Ratio ("DSCR") are 43.4% and 2.34, respectively, which are compliant with policy limits.
- **Segments and Sectors:** NAVs are distributed across applicable segments and sectors—Commercial (transportation), Essential (energy), International (international infrastructure), and Specialized (opportunistic infrastructure)—at 11%, 27%, 31%, and 31%, respectively. These data are informational only, as segment diversification compliance is measured at the Real Assets portfolio level.
- **External Manager:** As of September 30, 2017, the maximum Infrastructure Partner Relationship Exposure for the Program was approximately 2% (Harbert), and the maximum exposure to investments with no External Manager was 1% (Concession Holdings), which are both compliant with policy limits.[4]

Market Commentary[5]

Investors' interest in infrastructure, as indicated by unlisted infrastructure funds' dry powder, is still at all-time highs, with $159 billion of capital in December 2017, compared to $152 billion at the end of 2016, and $109 billion at the end of 2015. Annual deal activity is also still at top levels, with $337 billion in aggregate deal value announced in 2017, down from 2016 at $470 billion, but similar to 2014 and 2015 levels. Average completed deal value in 2017 was $356 million, up from the prior year ($326 million), and the fourth annual increase in a row.

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[1] As of September 30, 2017, per the Infrastructure Characteristics Datasheet provided by the Real Assets Unit for Risk, Region, and Segments/Sectors, and per the Real Assets Leverage Report for Leverage (p. 59 and 69).
[2] Target per Staff 2017 Annual Program Review.
[3] The Key Policy Parameters pertaining to risk and geographic segments will apply to the Infrastructure portfolio only when the NAV for that portfolio exceeds $5.0 billion, per the Investment Policy for Real Assets Program.
[4] Relative to a total Real Assets Program base (NAV plus unfunded commitments) of $46 billion.
[5] Commentary based on analysis of aggregated and deal-level data from Preqin, unless otherwise cited.

Geographically, the preponderance of the funds are focused on North America and Europe, with $71 billion and $54 billion in dry powder at the end of 2017, respectively, with a meaningful $20 billion focused on Asia, and $13 billion across other regions, relatively unchanged from the end of 2016. In 2017, deals were geographically somewhat more balanced than dry powder, with aggregate deal values of $135 billion, $82 billion, $64 billion, and $55 billion across North America, Europe, Asia, and the rest of the world, respectively.

Preqin's asset stage definitions and categorization provides some indication of risk profile at the deal level. Globally, and in most regions, between half and three-quarters of completed deal value 2017 was associated with "secondary stage" investments (a fully operational asset or structure that requires no investment for development), with "greenfield" (asset does not currently exist) deals coming in second in most geographies, and "brownfield" (existing, typically operating asset needing improvements, repairs, or expansion) representing 10% of the deal value globally, and in most geographies. These categories can very roughly be mapped to core, opportunistic, and value-add risk categories, respectively, ignoring other risk attributes such as geography and sector.

In 2017, deal sizes increased in three of Preqin's four reported deal bands, with the number of deals of less than $100 million shrinking to less than 50% for the first time since at least 2014, while number in the $100 to $499 million, $500 to $999 million, and $1,000 million or more increased in each band. These trends should be supportive of CalPERS preferred equity range, as a control or consortium investor.

On a sector basis, $262 billion of the deals completed in 2017 can be mapped to sectors CalPERS defines as infrastructure, with Energy assets representing 73% of aggregate deal value, Transportation 20%, Water 4%, Communications 3%, and Waste <1%.

- Within the energy sector, healthy activity occurred around wind power deals, especially in Europe, pipelines and power distribution in North America, and power plants in North America and Asia. Globally, renewable energy accounted for almost 40% of the total deal value, with wind representing more than half of that. CalPERS' own wind power deal is a case in point. The Infrastructure Program acquired two wind farms in Kansas and Oklahoma totaling 349 MW from Enel Green Power North America through its Gulf Pacific Power LLC account managed by Harbert. This investment expands CalPERS' renewable energy holdings through the preferred separate account structure.
- Within the transportation sector, airport transactions accounted for about one-third of the deal value, with roads (including toll), sea ports, parking lots, and railroads each between 10% and 20% of total sector deal value. Airport deal activity in the U.S. has historically been much less than in Europe; however, in November 2017, Westchester County, New York selected Macquarie Infrastructure Corporation from among three bidders to take over county airport operations. The transaction is still subject to the approval of the County Board of Legislators, but would award Macquarie a 40-year lease in exchange for a $595 million payment to the County and $550 million toward airport capital

improvements. The two other bidders both included institutional capital: FerroStar (Ferrovial and Star America); and HPN Aviation Group (Oaktree Capital Management and Connor Capital), according to press reports.

- Within the water sector, utility deals in North America, Europe, and Asia were roughly equal in value to water distribution deals in North America and Europe, with water and wastewater treatment transactions in all regions accounting for 14% of the total sector deal value. The sale of Affinity Water was a notable 2017 transaction in this sector. Infracapital and Morgan Stanley Infrastructure sold the U.K. water supply company to a consortium comprising Allianz Capital Partners, HICL Infrastructure Company (managed by InfraRed Capital Partners), and DIF Infrastructure for £687 million (~$900 million). Affinity provides an average of ~240 million gallons daily to 3.6 million people and 1.5 million homes and business in the southeast of England, according to press releases.
- Within the communications sector, most of the deal value ($7 billion) was in European and Asian telecommunications ($3 billion), with more moderate transaction value in North American internet and wireless investments ($1 billion). For example, in 2017, EQT Infrastructure Fund III acquired a majority stake in Spirit Communications for an undisclosed amount. Spirit provides fiber based data and broadband services to enterprises, governments, and wireless carriers in the Carolinas and Georgia, with a network of over 9,000 miles of fiber directly connected to over 2,400 buildings as well as over 2,500 cell sites, according to press releases.

Activity in California, not surprisingly, focused on renewable power deals: Preqin's database contains 33 infrastructure deals for 2017, with 25 solar and four wind transactions. Solar deals range in size from small farms to multi-site portfolios, with a mix of greenfield and operating assets. Other deals include a power plant, a water treatment facility, a water distribution system, and a shipping terminal. Institutional investors include Alberta Investment Management Corporation, BlackRock, Capital Dynamics, Fiera Axium, KKR, and Ullico. Project developers and strategics were also in the mix, including AES, D.E. Shaw, Dominion Energy, Hyundai Merchant Marine, Recurrent Energy, RWE Group, and Sempra Energy. Deal values were not consistently available for this data set. CalPERS was active in the California infrastructure market in 2017, but did not transact in the face of competitive pricing. In 2016, CalPERS did successfully take a 25% cash equity stake in Desert Sunlight, a 550MW solar photovoltaic power generation facility near Palm Springs, CA. The investment aligns well with Program mandates and has continued to perform well since acquisition, according to staff.

We expect the outlook for 2018 to continue trends observed in 2017, with robust deal flow coming from institutional fund exits, privatization of public assets, greenfield projects, and strategic sales. As we reported in November, we expect competition for core assets to remain fierce, driven by institutional allocations, managers' dry powder, and direct investors' appetite. We continue to believe that CalPERS' prestige as a partner for

investment managers and other investors provides a competitive advantage in the marketplace that the Program can use to its benefit with existing and new managers and other prospective partners.

Staffing Commentary Follow-Up from November 2017 APR

In the November 2017 APR, Meketa reported that of the Real Assets Program's 55 total positions, few were fully dedicated to infrastructure, based on the high-level review that was possible in the very short period we had between coming on board and the APR report deadline. Between then and January 2018, we have had an opportunity to gather and review additional materials and information related to the Real Assets Program staffing, roles and responsibilities, and skills and experience, and have conversations with staff. Based on this review, we revise and extend our remarks around staffing and resources as relates to the Infrastructure Program as follows.

- The Real Assets Program organizes staffing around the six investment segments for both the New Investments Team ("NIT") and the Portfolio Management Group ("PMG"). The Portfolio Analytics, Research, Risk, Government & Operations Team ("PARRGO") organizes staff by functional area.
- Five of the segments—Commercial, Consumer, Essential, International, and Specialized—include one or more infrastructure sector, along with several other real assets sectors (real estate and/or forestland). No segment is infrastructure-only, but one, Residential, includes no infrastructure sectors.
- Under this structure, NIT and PMG staff are dedicated to specific infrastructure sectors, but also will typically, to varying degrees, work on real estate and/or forestland investments. Many staff have meaningful-to-extensive experience in one or more infrastructure sectors, at CalPERS and/or in previous employment. PARRGO assignments are understandably cross asset, segment, and sector.
- This approach lets the NIT and PMG take advantage of investment professionals' infrastructure-specific experiences and skill sets in the distribution of segment assignments. At the same time, having staff work across asset classes provides flexibility in managing workload distribution for new and existing investments. For example, we understand that two of the NIT Investment Managers and their associated staff currently spend most of their time on infrastructure, and another spends about half their time on infrastructure given the recent relative deal flow in infrastructure compared to real estate and forestland.
- Having some degree of infrastructure specialization, combined with real assets generalization appears to create beneficial integration that might not otherwise be achieved with more asset class specialization. It also may broaden the pool of potentially interested and qualified candidates for the NIT and PMG positions under recruitment and provide optionality for finding the best matches that will complement and strengthen the existing staff.

Conclusion

We believe the Program's performance for the reporting period and all other trailing periods has been impressive relative to the benchmark and the portfolio's development and current position is appropriate and consistent with applicable policies and guidances. We also believe the matrix staffing organization is a reasonable and effective approach to assigning certain roles and responsibilities to take advantage of cross-asset class participation, and a degree of specialization in infrastructure sectors via segment coverage.

Please do not hesitate to contact us if you have questions or require additional information.

Sincerely,

Stephen P. McCourt, CFA
Managing Principal

Lisa Bacon, CAIA
Senior Vice President

SPM/EFB/nca