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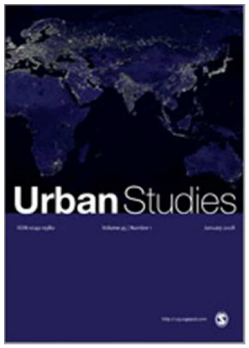

Financialising Urban Water Infrastructure: Extracting Local value, Distributing Value Globally

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Abstract

Since the insertion of urban infrastructure into the risk-taking world of financialisation, techniques for capturing added value from underlying revenue streams, from securitisation and derivatives to the structuring of bond and equity returns, have come to the fore. A value model, based on extraction through interest and dividends paid, as well as multiple fees, in our view, has benefited investors and financial intermediaries alike. Through the example of Carlsbad desalination plant in San Diego, California, the paper sets out to show how a piece of drinking water infrastructure was translated as a value asset to match the needs of institutional investors in the US and beyond. The geography of value capture and its distribution globally is shown to be not simply financially innovative, but also spatially innovative and perhaps best understood through its topological spaces.

Keywords: Built Environment, finance/financialisation, globalisation, Infrastructure, topology

Introduction

The Carlsbad desalination plant in San Diego, California, the largest of its kind in the Americas, which opened in 2015, represents something of a development in the consolidation of urban infrastructure as a financial asset class, or more specifically in the ability of financial intermediaries to extract value from illiquid assets by turning them into liquid forms. The 1 billion dollar reverse-osmosis plant, built and owned by Poseidon Water, a private developer of water infrastructure in the US, is projected to provide a sizeable proportion of the future water needs of a drought-stricken California (Poseidon Water, 2015). It is also arguably a site of financial innovation, one projected to show how a piece of urban water infrastructure can be financially structured to capture added value for a range of institutional investors (Allen and Pryke, 2013; Loftus and March, 2016; March and Purcell, 2014) and, in so doing, create a pool of fee-paying and spread opportunities for those acting in-between.

Morag Torrance (2008, 2009) set out a decade ago how the urban infrastructure landscape was fast undergoing financialisation, where the value of a place was captured by institutional investors operating through relational networks at-a-distance whilst distributing the risk globally. She showed how such networks took shape through the actions of global institutional investors working in partnership with fund managers and those with more local, specialised, legal and operational knowledge closer to the ground, so to speak. With each actor bringing something different to the investment table, Torrance sketched the relative power play between the different interests involved. What was less in evidence was how the local value of infrastructure was actually captured; that is, the skilful means by which intermediaries extracted the value of the infrastructure by translating their investment qualities into investment opportunities and structuring deals to realise greater total returns over the lifetime of projects (Bryan et al, 2016; Christophers, 2015; Erturk et al, 2008). With Carlsbad, this amounted to more than just plugging a Californian desalination plant into global financial networks, but rather a financial structuring of it as a value asset that matched the needs of institutional investors as

far afield as the UK, Netherlands and Malaysia, and generated profits for fund managers and investment bankers alike.

What Torrance clearly recognised, however, is that the extraction and distribution of value is an intrinsically geographical process; that there is a spatial element to both the capture and the circulation of value which is constitutive of the relationships forged. For her, investment in infrastructure is a form of relational investing, where the networks constructed to put together a local deal span the globe regardless, it seems, of the physical distances involved. Proximity, on this view, is something established through networked relationships, where local infrastructure embodies a specific geographical rate of return that can be accessed from afar. What she was edging towards, in fact, was a more topological than topographical landscape of urban infrastructure, one where large scale infrastructure projects like Carlsbad can be 'lifted out' from California, reduced to their investment qualities, and stretched into the US bond and equity markets and far beyond. There is, we argue, an element of spatial innovation behind such a chain of financial transactions whereby future revenue streams are matched with particular institutional risk profiles and investment horizons, and the enhanced value of such streams circulated and distributed globally (Engelen et al, 2010).

In the following section, we outline how urban infrastructure has not only been transformed into an asset class capable of being traded as a financial product, but that the relationship between financial markets and urban infrastructure has evolved into ever more sophisticated ways of extracting value and profits. After that, using the Carlsbad desalination plant in San Diego as a case study, we set out to show how, for the plant to become a value opportunity in the first place, it had first to be 'disassembled' into its investment qualities and translated for bond and equity investors. By translation, here, we mean the process of value projection geared to the different yield and risk profiles of investors. On the back of such projected returns, Carlsbad was effectively 'reassembled' to deliver a set of revenue streams and instalment payments that underpinned the price of drinking water for San Diego residents. In the final section, we pull out the topological times and spaces that

financially disassemble a desalination plant and reassemble it as a reworked revenue stream.

Such claims are underpinned by access to the Preqin Infrastructure data base, a unique source of financial infrastructure data focussed on deals conducted worldwide. The data base was used as an initial source to identify deals and key players with additional data prepared by Preqin to help add detail to specific deals and key actors. The significant advantages of Preqin's data base is that it offers a comprehensive, reliable and continually updated source, used by the industry itself, and also a significantly advantageous means to develop a data rich picture of key actors, from general partners to secondary investors, through to detailed analysis of performance benchmarks to include the constituent funds, key indicators and relative performance. These wide ranging data both informed (particularly the selection of actors and the Carlsbad case study) and supported fieldwork conducted between 2014-5 in New York and London that gave access to investment bankers, pension funds, fund managers, placement agents, lawyers and financial advisors engaged in the financialisation of infrastructure. Each of the actors identified was further explored through the data base thus helping to build up an intricate picture of the emerging networks of financing, extraction and distribution of value. Both data sources are mobilised throughout the paper and the Preqin data forms the key source for the Figure and Tables in the paper.

Extracting Value from Urban Infrastructure

The moment urban infrastructure was lifted out of its previously stable, public operational world and inserted into the risk-taking world of financialisation, as O'Neil (2009) pointedly outlined, the search for value took centre stage. In the hands of private finance, the seemingly immutable world of bridges, toll roads, airports, water utilities and the like was transformed into tradeable financial products, often bundled up into separate investments so that the value extracted is commensurate with other investment opportunities available elsewhere (Bryan and Rafferty, 2006). The transformation of an illiquid asset into a liquid form lies at the heart of this

financial process, where new types of liquidity such as securitisation and derivatives trading formally represented novel techniques for extracting value (Bryan et al, 2016). Such techniques are a means of capturing and circulating value, not merely by tapping the reliable revenue streams that 'big ticket' infrastructure items offer, but arguably by enhancing value over time and enriching those acting in-between.

Liquid Infrastructure

O'Neil (2009) was among the first to spell out how such financial techniques worked in relation to the securitisation of predictable, long-term revenue flows that urban infrastructure assets offer. Recognising the lead role in the process performed by the Australian bank, Macquarie, he documented their skill in taking a piece of infrastructure and turning it into

' a set of financial products devised as highly liquid conduits for the capturing of recession-proof cash flows capable of being generated over long periods of time in accordance with the necessities and predictabilities of urban life' (2009, 175)

The ability to turn an illiquid asset into a liquid form thus lay at the core of Macquarie's capabilities, not only by securitising the revenue streams of recession-proof assets and projecting claims on its value into the foreseeable future, but also by generating fees from every stage of the securitisation process. The complexity of the process and the need for orchestration enabled banks like Macquarie to skim value from the packaging and selling of the underlying assets, the issuance of debt, as well as from the long-term management and disposal of such investments. When Torrance (2009) spoke about financial institutions capturing the value of place through the appropriation of urban infrastructure assets, the capabilities of Macquarie were precisely the ones that she had in mind. What O'Neil and others who follow the financial manoeuvres of Macquarie have added to that observation is an understanding of the means by which that capture is accomplished.

Our in-depth study of the financialisation of Thames Water, the UK's largest piece of water infrastructure (Allen and Pryke, 2013), provided an 'ideal-type' case study on

how the extraction of securitised value is achieved. Owned by a consortia of institutional investors, which, until recently, was led by Macquarie's European investment arm, Thames Water securitised household water bills for some 13 million customers over a period of 50 years up to 2062. Taken at face value, the leveraging of debt through securitisation is not in itself a form of value extraction if used to consolidate existing debt and pass on the savings to customers, in this instance, through lower water bills. Thames Water, however, were shown to have other purposes in mind; namely, to use the funds raised through securitisation to pay investors higher dividends, to pay off interest on intra-company and external loans, and to maximise fee income. In effect, Macquarie, by using borrowed money to fund substantial dividends over and above that actually earnt from cash flows were able to bring forward future income streams - household water bills not yet paid - and make them work to the advantage of investors and intermediaries in the present moment. It was, in short, a means of local value extraction and its distribution to investors across the globe.

Loftus and March (2016) built upon that analysis of debt refinancing to show how similar practices have shaped Thames Water's ambition to build the UK's first large-scale desalination plant, as well as construct a massive 'super sewer', the Thames Tideway Tunnel. Desalination plants, as will become apparent when the Carlsbad plant in San Diego is considered, are increasingly hailed as a high-tech solution to drought and over-stressed aquifers in different parts of the world. They can, however, also be considered a feat of financial, as much as civil, engineering, in that a new breed of investor-operators are keen to exploit the value of the projected revenue streams that such plants generate. In the case of Thames Water, that amounted to exploiting a highly leveraged financial model to extract value beyond that conventionally realised in a regulated domestic water market. Elsewhere, as Loftus and March point out, in Spain for example, traditional water companies have adopted similar financial practices as they shed risks attached to large fixed capital projects and adopt more convertible means of extracting embedded value from water infrastructure (see also March and Purcell, 2014).

Engineering value?

Without wishing to exaggerate the point, there would appear to be a growing recognition that the financial rate of return on urban infrastructure is not entirely dependent upon the predictability of underlying revenue streams. Securitisation is one means to capture added value by debt refinancing, but as Ashton et al (2012) have shown there are other ways by which financial actors can engineer value from infrastructure. In their modelling of the financial returns available from urban infrastructure deals, they pointed to an evident discrepancy between the projected gains estimated by public officials and those anticipated by their private sector counterparts, with the latter estimations considerably higher. The divergence, they suggested, can be traced, in part, to the fact that public sector evaluations focussed almost exclusively on the income generating value of the asset itself, whereas private investors focussed on the potential for value extraction after the completion of the deal. While the former estimated returns on the ability to improve the asset, by improving operational efficiencies for example, the latter based their projected returns on the use of financial techniques to reduce the cost of debt and defer its payment.

Such financial techniques, from interest rate swaps and deferred payment sweeps through to the refinancing of debt from short to long term liabilities, are arguably part of the skill set deployed by banks and asset managers, although what Ashton et al bring to the mix is the significance they attach to the internal rate of return on investments, or IRR as it is commonly known. The IRR is a measure of the overall rate of return on an investment over time; that is, overall in the sense that the returns achieved by the use of derivatives and refinancing options are factored in early on at the outset, together with the cash flows generated by the infrastructure operation. It is a measure that, for investors, reflects the investment value over and above the market value of an asset. 'Engineering', in this context is thus perhaps best thought about as just another way of talking about the skill set by which well-positioned intermediaries devise novel techniques for creating and capturing value. It is, in our view, what investment banks, fund managers and financial advisors perform as a service for investors when, for example, they translate the financial qualities of a toll

road or a desalination plant into an investment opportunity, and generate fees in the process.

Ashton and his colleagues viewed such engineering as a reflection of the deepened relationship between financial markets and infrastructure, to the point where the search for value drives asset ownership and operation. That search, to all intents and purposes, highlights the need for assets to be 'worked' through by well-situated intermediaries to generate and realise value. Such intermediaries, it should be stressed, are not simply in the game of 'finding 'value, but of actively constructing it. Following Christophers (2015), their aim is to generate value in a variety of forms, from shareholder gains, derivative premiums, and market making spreads through to multiple fee-earning opportunities, often in a combination of ways. So, for instance, the use of interest rate swaps to reduce the cost of borrowing noted by Aston et al, also generated fees for writing the contracts, as well as the possibility of extracting premiums. Likewise, the securitised revenue streams diverted to pay higher dividends also generate fees for the underwriting and issuing of securities, as well as create an opportunity for agents to earn a spread from buying and selling debt.

Christopher's (2015) breakdown of the different sources of value behind the actions of financial intermediaries provides an insight into the diverse ways that value can by extracted from infrastructure assets, often to the advantage of both investors and intermediaries (see also, Dixon, 2017). His analysis points towards the manner in which banks, asset managers and other financial actors construct value by identifying and exploiting infrastructure opportunities, essentially by pulling out their investment qualities and extrapolating future returns based on value projections. Torrance (2009) sketched the type of relational networks put together by financial intermediaries who sought to exploit the conjunctural opportunity that the consolidation of infrastructure as an asset class had opened up, and the different kinds of financial knowledge that had to be pooled to facilitate that possibility. In that context, the kinds of investment qualities projected onto the value of infrastructure outlined above represent value projections calculated to appeal to global investors operating at-a-distance (Clarke and Monk, 2013; 2015).

The notion of exploiting the conjunctural opportunity that infrastructure as a maturing asset class opened up is borrowed from Engelen et al's (2010) observation that evolving markets structure possibilities for financial innovation, as well as close them down. Financial innovation, on this understanding, though, is not restricted to headline derivatives, the hedging of possible interest rate changes or swings in currency exchange markets, for example, but encompasses a range of financial techniques that capture value: from the refinancing of debt and the reduction of borrowing costs through to the restructuring of bond and equity returns over the lifetime of a project. On this view, everything from the evaluation of operational cash flows to value searches and their extrapolation, through to the discounting of future value streams, feed into expected returns. Such future investment performances are effectively value promises; promises that a toll bridge or road, for example, or, as we now show, a desalination plant, may be broken down into its investment qualities and translated for the different risk profiles of investors.

Translating Carlsbad

Carlsbad desalination plant in San Diego, California is just such a value promise. The plant itself, a 1 billion dollar reverse-osmosis facility that has the capacity to convert 56 million gallons of seawater into drinking water every day, was built and is owned by a private water company, Poseidon Water (Poseidon Water, 2015). The company has a chequered history with desalination in California, having been involved in the finance and construction of the Tampa Bay desalination plant which had to be taken into public ownership after the private financing for the plant fell through. What distinguished Carlsbad's six-acre site from the likes of Tampa Bay, however, was the innovative abilities of a number of financial intermediaries, from investment bankers and fund managers through to placement agents and financial advisors, who were able to translate the financial qualities of the plant into a discrete investment opportunity, and in so doing generate value for bond and equity investors in the UK, US, the Netherlands and beyond. Following Ashton et al, an overall rate of return was factored into the deal at the outset which reflected the investment value of the

plant, not in this case through the use of derivatives, but through the financial structuring of the bonds and equities to extract value over the term.

The driving force behind the translation of Carlsbad into an investment opportunity with specific value promises was the fund manager, Stonepeak Infrastructure Partners. The lead member of a consortium that included Poseidon Water and the Swiss-based investment advisors, Partners Group, Stonepeak set up the infrastructure fund that raised the equity for the Carlsbad project and orchestrated the means by which the bond finance was raised to meet the costs of plant and pipeline construction. As the lead player, it performed the crucial role of bridging a number of investor interests, as well as binding together the actions of a wide range of intermediaries. Figure 1 shows the key financial intermediaries responsible for raising the $900 million plus financing required for the project, split between bond finance totalling some $733 million for plant and pipeline construction, and $167 million equity finance for the development of the project. Behind such overall numbers, however, lie a series financial techniques for identifying and extracting value, orchestrated primarily by Stonepeak.

Insert Figure 1: Financialising Carlsbad Desalination Plant (Source: Authors, adapted and modified from CPCFABFP, 2012)

The left hand side of Figure 1 draws attention to those involved in raising the private equity component. Stonepeak, as noted, was the main actor responsible, together with the placement agent, the New York and London-based, First Avenue, for raising the infrastructure fund. The fund itself closed in 2013 above its original $1 billion target and on schedule, with the Carlsbad Desalination Project one of its first assets. The role of First Avenue was crucial to the fundraising process, tapping investor interest and negotiating advanced access through incentives to ensure an early up-take, especially in terms of attracting a high calibre investor to 'anchor' the fund. Securing the latter acted as a beacon for subsequent investors, signalling financial qualities of investment confidence and reputation. The brokering of investor interests and the subsequent translation of Carlsbad into an investment opportunity,

jointly engineered by Stonepeak and First Avenue, attracted the bulk of the equity to finance the development of the desalination plant (see Preqin, 2014 a,b,c&d, 2015 a&b).

The remainder of the equity, just under a third of the total, was provided by Partners Group, raised through a combination of co-investment and the group's own diversified global infrastructure fund. . Together with Stonepeak's equity stake, Partners Group's funds fed directly into the project company, Poseidon Resources, a Special Purpose Vehicle set up to finance, construct and operate the desalination plant. The role of Poseidon Resources Channelside, just above the project company in Figure 1, was to act as a holding company for Stonepeak who had overall management responsibility for all the investors involved, most of whom were limited partners.

On the right hand side of Figure 1 are those actors responsible for raising the bond finance for Carlsbad, which was presented as an opportunity to invest in the US municipal bond markets or 'muni funds'. That opportunity was marketed by the US investment bank, JP Morgan, who underwrote the bonds on behalf of the California Pollution Control Financing Authority, the bond issuer. The bank embarked upon a marketing programme that involved deal-specific and non-deal roadshows, as well as pre-recorded net roadshows and dedicated calls between potential investors and representatives from San Diego County Water Authority (SDCWA), Poseidon and JP Morgan (JP Morgan, 2013). Effectively, such roadshows and one-to-one relationships were attempts to translate Carlsbad as a financial asset for different groups of investors, drawing attention in particular to the innovative use of municipal bonds on offer (The Bond Buyer, 2014; SDCWA, 2013; Project Finance, 2013). Clean Energy Capital, located towards the bottom right of the figure, advised both Poseidon Water and the San Diego County Water Authority on the advantages of using municipal bonds as opposed to the more conventional use of bank debt to finance the deal

Each of the financial actors above, in deploying their specific skill set in relation to their particular part of the deal were able to identify and assess value both for

themselves and, over the longer term, for a range of investors. Where Stonepeak risked its investment for capital gain and future fees, as well as extracting fees for fund management, Partners Group charged fees for advising its overseas investors and, in all likelihood, for mitigating future currency risks on their US dollar returns, and, JP Morgan, in contrast to both, underwrote the bonds whilst risking their own capital in the process to generate fee and spread opportunities. Aside from the multitude of fee-earning opportunities attached to the plant, the structuring of bond and equity returns over the life time of the project, to realise interest and dividend payments as well as capital gains for US and international investors, represented the prime means of extracting local value and its global distribution.

Folding in equity investors…

Tables 1 & 2 set out the list of pension funds and insurance companies who invested in Stonepeak's and Partners Infrastructure Funds, respectively. Stonepeak's equity investors were drawn mainly from US private and public pension funds, and included two insurance companies, a US firm, American Family Insurance, and a Malaysian company, Kumpulan Wang Persaraan. The sums invested varied significantly, from as little as £30 million sterling from the UK's Greater Manchester Pension Fund to $400 million from the US Teachers Insurance and Annuity Association – College Retirement Equities Fund (TIAA-CREF). The sums, though, mask differences in the investment needs and dispositions of the investors and Stonepeak's brokering role was to match those to tailored investment opportunities.

Insert Tables 1&2: Stonepeak Infrastructure Partners Investors and Partners Group Global Infrastructure Investors (Source: Prequin 2014a&c; 2015b)

The US public pension fund, Oregon State Treasury, by way of their Investment Council, is one example of how such tailored opportunities were negotiated and translated to suit a particular financial profile. The State of Oregon Investment

Council was initially introduced to the Stonepeak Fund by the placement agents, First Avenue, who put the Fund's potential in front of the Council after having first identified their desire to 'build out the 25-35 per cent target allocation of the infrastructure sleeve of the alternative portfolio' (Oregon Investment Council, 2012). On the advice of Oregon Staff and Torrey Cove, a San Diego based advisory firm specialising in advising clients in the choice of 'global alternative assets' who foregrounded the stable and predictable nature of infrastructure cash flows, Oregon State Treasury invested $100m in the Stonepeak fund (OIC, 2012; Torrey Cove Capital partners, 2012).

Much was made of Stonepeak having attracted an initial, 'anchor' investment in the fund from TIAA-CREF, in so far as Oregon's investment followed a $400m so called anchor pledge from TIAA-CREF, as well as a $250m commitment from Washington State Investment Board, and $40m from New Mexico Educational Retirement Board. The significance of the 'debut 'label is that, at the time of investment, no return data would have been available to potential investors, leaving them unsure as to the risks involved. The narrative woven through the strategy by Stonepeak's representatives was pivotal, highlighting not only the anchor investment by TIAFF-CREF, but also the Fund's 'value creation strategy', with a target yield of 8-10 per cent and total return of 13-15 per cent, which included not just interest and dividend payments, but the potential rise in the capital value of the Stonepeak Fund. That coupled with Stonepeak's intensive management experience of operating portfolio companies, such as Poseidon, together with their past financial experience gained at Blackstone, signalled their reputation for creative approaches to the structuring of infrastructure deals (Oregon Investment Council, 2012, 2013; see also Myers, 2011; State of Michigan, 2014a and 2014b; New Mexico Educational Retirement Board, 2013; Washington State Investment Board, 2012).

By way of contrast, all of Partners Group's investors were from the other side of the Atlantic, mainly public sector pension funds from the UK, alongside two private pension funds from the Netherlands, Dow Chemical Company Pension Fund and the Healthcare Insurance Industry's Pension Fund. The sums involved were relatively

small in comparison with their US counterparts in Stonepeak's Fund, mostly around the 20-50m Euro mark. Many of the equity contributions took the form of co-investment, a more direct route into infrastructure-related assets, but also indirectly through a fund of funds vehicle. Some investors combined the two, enabling a more diversified portfolio on investments that balance out exposure to risk and excessive fees. As with Stonepeak, the stable and predictable nature of revenue streams from infrastructure assets like Carlsbad was a key attraction for the European pension funds, but arguably more important was the targeted yield and fixed term interest rate projected from the financial structuring of the deal (Partners, 2014, 2015).

The Warwickshire Pension Fund in the UK, for instance, made its maiden investment in the infrastructure asset class, a £35 million commitment with a 12 year investment horizon, through the Partners Fund. The latter provided assurance of its diversified range of direct and indirect investments, together with present and future projections, and made the case for infrastructure as an alternative investment to gilts and government bonds:

'Revenues are secured by a 30-year "take-if-delivered" Water Purchase Agreement with the San Diego County Water Authority, eliminating volume and price risk. The project also offers a predictable cash flow profile and strong cash yield, with major costs structured as pass-through items and an average pretax cash yield of 14% during the first ten years of operation. Moreover, this investment carries limited counterparty risk as the San Diego County Water Authority is AA+ rated and this obligation will be considered an expense serviceable before debt obligations. With its attractive return potential, we believe this is a more productive investment than a German Bund or a US treasury bond. Going forward, pension funds will be well-advised to include such projects in their asset allocation to avoid falling into the long-term return gap' (Partners Group, 2012:18).

For the Warwickshire Pension Fund, the fund represented an opportunity to invest directly through co-investment, where the co-investment in this case is held by the investor directly on their balance sheet, but with the 'deal' run by the fund (Hymans

Robertson, 2014; Warwickshire, 2014). It also represented a lower risk option for investors moving into infrastructure assets for the first time, one that contrasted with many of Stonepeak's more mature infrastructure investors whose profiles are relatively less risk adverse. The matching of profiles to investment opportunities, as noted previously, is precisely what such intermediaries, drawing upon their financial skills, seek to achieve. The brokering and aligning of investor interests, so that equity stakes reflect their dispositions in terms of yield and risk profiles, relied in this instance however upon Stonepeak and Partners being able to demonstrate the enhanced value to be realised from the financial structuring of the deal. The same creative approach, it should be said, was also behind raising the bond finance for Carlsbad's plant and pipeline construction.

…and stretching into the municipal bond markets.

That responsibility, as noted earlier, was undertaken by JP Morgan who underwrote the plant and pipeline bonds on behalf of Poseidon Resources and the San Diego County Water Authority respectively. Table 3 provides a breakdown of the bond finance raised for Carlsbad, some $733 million in total, with $530m raised for plant construction and $203m for the 10 mile pipeline that connects the plant to San Diego's distribution system. The left hand column represents the risks and returns allocated to Poseidon, a private company, and the right hand column to those allocated to SDCWA, a public body. The bond yields for the two entities differ over time, by maturity and term, with the plant bonds offering a higher rate of return over the various loan periods up to 2045. Such an opportunity to invest in the US municipal bond markets hinged upon the creative techniques of bond financing, linked in this case to the unit price of water, where future returns over a 15 year or longer period, all the way up to 2045, effectively represented the rate of value extraction. On top of which, the rate of interest paid for the lower investment grade bonds guaranteed a higher overall rate of return than would have been the case if the bonds had been issues by the Water Authority as AA+.

Insert Table 3: Carlsbad Desalination Plant Series 2012 Water Furnishing Revenue Bonds (Source: JP Morgan, 2013)

Crucial to the success of the bond issue was the ratings process undertaken by Moody's and Fitch, with the former assigning a Baa3 rating and the latter a lower BBB rating for both plant and pipeline bonds (Moody's, 2012a&b, Fitch Ratings, 2012). The rating agencies performed a key role in stabilising Carlsbad as an investment opportunity, spelling out the risks and rewards involved, highlighting its 'unique debt structure' which sees the plant bonds secured by net revenues from plant operations and the pipeline bonds secured by instalment payments from the SDCWA, with the added proviso that in the event of a shortfall, Poseidon would cover the pipeline debt service (Fitch Ratings, 2012; Moore, 2013; Clean Energy Capital, 2013, 2014). Also, key to that value projection was the stress placed by the rating agencies upon the reputation of the project operator and their ability to manage the organisational risks. Such reassurances were vital given the innovative nature of the deal which raised the funds through US tax-exempt, AMT municipal bonds, bonds that are tax-exempt because they fall within a certain category of municipal infrastructure, in this case a water service bond. The higher yield of AMT bonds reflects the risk sometime in the future that they could become taxable.

For the Carlsbad bond deal to be attractive to the wider investment community, JP Morgan not only had to project the bond sale as a unique opportunity in US 'munis', they also had to reach out to potential bondholders and enrol them into the technological peculiarities of Carlsbad. In that respect, they were only partially successful, given that the take up for the bonds left JP Morgan in a position where it had to commit its own capital, some $100m, to underwrite the issue. The vast majority of the plant and pipeline bonds were bought by bond funds, followed by insurance companies and investment advisors, with JP Morgan picking up the balance to preserve low yields for the SDCWA (see Figure 1, top right hand corner, for a percentage breakdown of the institutional sales). The sale itself was restricted

to 'Qualified Institutional Investors', of which there were less than 30, indicating the bespoke nature of the bond deal.

As with the total targeted return on equities achieved by Stonepeak and Partners, the financial structuring of Carlsbad's bonds represented the means by which value was and still is extracted from the deal, and then distributed globally to bond holders over the term of the bond. Significantly,the equity returns and bond interest rates factored into the deal at the outset constitute much of Carlsbad's value promise, one achieved not through securitisation or derivative trades, but rather through the skill in putting together a deal dependent on an engineered price for household water roughly twice that of the most readily available alternative source. Financial innovation, in this context, thus involved techniques for identifying and constructing value as much as matching up overall returns to the varied dispositions of investors across the globe. There is, as such a geography to the value promise and its distribution, one which ties not only Stonepeak, Partners and JPMorgan together, but also connects them to institutional investors in Malaysia and Manchester, as well as Amsterdam and a number of US States.

A Geography of Value Capture and Circulation

The value embedded in a piece of urban water infrastructure, at first glance, may be evident from its underlying revenue streams over time. As has been suggested, however, well-positioned intermediaries are capable of financially structuring an asset to generate value above and beyond that apparent from predictable cash flows. In the case of Carlsbad, the value had to be pulled out and translated into an investment opportunity for private pension funds, insurance companies and public investment bodies, spun out into the future over a series of fixed term bonds and parcelled out to equity investors. For that to happen, though, the plant itself had to lose its 'plant-like' qualities and be assessed and parcelled out as part of an emergent asset class where its financial qualities were to the fore. It had to be 'disassembled', so to speak, broken down into its investment qualities, in order for it to move into the immaterial flows of international finance.

That movement takes place, as Torrance (2009) demonstrated, when infrastructure assets are passed through global financial centres like New York and London and their investment qualities sifted and sorted by a density of financial intermediaries capable of identifying value opportunities. Such centres comprise 'evaluative cultures', sites through which meaning is produced by working practices that identify and assess the financial qualities of an asset, and the type of financing best suited to extract those qualities (Pryke, 2010; Muniesa, 2012; Mackenzie, undated). As part of that evaluation, however, value projections have to be 'reassembled' as an overall rate of return, which in the case of Carlsbad amounted to a series of interest payments, dividends and capital gains enshrined in a 30-year water purchase agreement.

Disassembling and reassembling Carlsbad

The disassembly of Carlsbad and its financial reassembly were not sequential processes, but rather different sides of the same innovative process. Torrance's (2009) account of relational investing whereby fund managers and other financial actors bridge and broker relationships between investors hinted at the types of financial disassembly involved, although her focus was more on the local partner content of infrastructure deals. She did, however, recognise the difficulties of evaluation, with different ideas on financial structuring and valuation in play between the different parties, and the need to project a geography of the rate of return associated with infrastructure deals across the globe. But the geographical rate of return is more the end point of the process, with the pulling out of a piece of infrastructure's financial qualities, its disassembly into the number and times of the marketplace, a means to that end. The practices of New York-based fund managers like Stonepeak are, in that respect, arguably more in line with Engelen et al's (2010) description of the process as one of adaptation and improvisation as they work out the best ways to extract the value of an infrastructure asset over its lifetime.

For Engelen et al, the identification of a profit-making opportunity takes place against the backdrop of a specific configuration of asset market conditions, where a conjunctural opportunity like that of infrastructure emerging as an asset class offers the potential for exploitation if novel ways of extracting value can be identified. There is an element of pragmatism and risk involved, where what works best is not entirely evident so that experimentation and improvisation are used to narrow down the possible range of techniques available. In certain contexts, securitised debt may represent the best means of realising the embedded value of an infrastructure asset, while in others the use of headline derivatives may offer the best way forward. With the Carlsbad desalination plant, the blend of private equity and municipal bonds used to finance the project and the techniques used to extract value made it possible for Stonepeak to project and translate its investment qualities to global investors.

The financial disassembly of Carlsbad, as it were, the breakdown of it into tranches of private equity and municipal bonds, as opposed to a conventional debt-only option, usually that of bank debt, was hit upon by Stonepeak as they explored which avenue of financing best suited a long term deal attractive to investors not typically involved with infrastructure project financing. The evaluation of the desalination plant whereby representations of its value through time were initially identified and made 'readable' to a wide range of investors constitutes an early stage of Torrance's relational investment process, where geographical networks are constructed to put together a local deal, but crucially it draws attention to the translation of possibilities involved that is required to bridge previously unconnected investors and bring them into some form of alignment around a value promise. There is, as we have argued, an element of spatial innovation behind the forging of relationships that matches the particular institutional risk profiles of globally distributed pension funds, insurance companies and public sector institutions to local revenue streams capable of delivering value from bond and equity returns in the foreseeable future.

That 'future' was integral to the financial evaluation of Carlsbad and formed part of the financial reassembly of the plant as a long term contractual revenue stream capable of delivering the percentage returns 'promised' to international equity and

bond investors. In 2012, San Diego County Water Authority entered into a 30- year Water Purchase Agreement with Poseidon Resources Channelside, the holding company set up by Stonepeak to manage the Carlsbad project and its investments. That agreement effectively guaranteed a market for the plant's water, with the authority agreeing to purchase a stated volume of water at a set unit price over a 30 year period, regardless of whether the water is needed or not by the residents of San Diego (see SDCWA, 2012, 2013; Poseidon Water, 2015). As such, the agreement took the risk of fluctuations in the price of San Diego's water out of the equation and guaranteed a predictable and stable revenue stream from the operation of the plant. But, more importantly, the unit price of water enshrined in the agreement was structured financially by Stonepeak to meet the projected equity return and bond interest rates over the lifetime of the project.

The Water Purchase Agreement was 'engineered' to meet the future financial yields of equity and bond investors across the globe and represented the means by which value has been and continues to be extracted from Carlsbad. Over half the household water price is attributable to the capital charge and at its core are the bond issuance and equity return, with the remainder taken up with fixed charges and operating costs. To meet the overall returns required by investors, water bills are thus projected to rise for the average San Diego household by $5-$7 per month, with an estimated decrease after 16 years (Barringer, 2013). Significantly, the total return on investment from the fixed interest payments over the term, the likely dividends paid and the potential capital gains realised were calculated by Stonepeak at the outset as a possible way of extracting value from a piece of urban water infrastructure.

The cost is one borne by San Diego households not the water authority who negotiated the deal and, as such, removes much of the local politics of water supply from those who actually pay the water bills. As one local newspaper columnist put it, this '…isn't a problem for Poseidon, it's a problem for Orange County ratepayers. Poseidon's contract requires Orange County Water District to buy every gallon of high-priced water Poseidon produces for 50 years [30 years of WPA plus an optional 20 years], whether Orange County residents use the water or not' (Brown, 2016).

Local opposition to the deal was and continues to be evident nonetheless from those who had no choice over their water supplier, nor any ability to influence the terms of the deal, in particular the unit price of water to be paid over the period of the agreement.

Topologies of the Urban

It is reasonable to suggest that a geography that combined the bond prices achieved by JP Morgan in New York and the targeted equity returns sought by Stonepeak influenced San Diego's unit price of water at-a-distance. This is perhaps not so much the investing 'at-a-distance' that Clark and Monk (2013) had in mind when they spoke about 'beneficiaries, fiduciaries and agents…electronically linked together over space and time' (2014, 536) and rather more the kinds of action at-a-distance that Bruno Latour has spoken about (2005). A 'local', urban place like San Diego and the financial insertion of the Carlsbad plant into it, replete with its projected returns, would in that instance resemble the kinds of connections through which space and time interfere with the 'local': the projections of JP Morgan in New York and 'on the road' in respect of future returns from the plant and pipeline bonds, for instance, or of Stonepeak's 'value creation strategy' for global equity investors. On this Latourian 'take', no place is self-contained enough to be 'local' and the idea of Carlsbad being reassembled financially would have to take account of what circulates over this now flattened 'global' space (Latour, 2005, 204-5).

Such a flattened topography, however, where it is possible to conceive of places 'co-existing' in space and time, San Diego with New York, New York with Kuala Lumpar or Manchester, for example, is not the same as conceiving of places as 'lifted out' from California, passed through New York's evaluative cultures, and re-embedded financially as a Water Purchase Agreement. Rather than the co-existence of places across a flattened landscape, the financial relationships between different actors – Stonepeak, Poseidon, SDCWA – are more one of co-presence (Allen, 2016). Co-presence, in this setting, is a relationship where the spacing and timing of the

interaction takes place between people who are either present in real time through a variety of telecommunication and media technologies or are mediated through relationships where the representatives of, say, Stonepeak, are physically present but the authority for negotiation remains firmly elsewhere in New York's financial district. To all intents and purposes, those elsewhere have a 'detached' presence which provides a sense of 'nowness' to the arrangement that belies the physical distance between New York and San Diego.

The distances involved are best thought about as relational, not ones that can be measured in miles or kilometres. In this topological setting, the relations of presence and absence are reconfigured so that the gap between the east and west coasts of North America is bridged by the financial relationships involved, and distance itself is understood as a product of those relationships, rather than anything measurable (Callon and Law, 2004; Hetherington and Law, 2000; Mol and Law, 2001). The bond yields for Carlsbad's plant and pipeline, for instance, the rate of return at different maturities, is not something that merely circulates between New York and San Diego, or simply connects the two places across a flattened America; rather it informs the unit price of Carlsbad's drinking water more or less directly as an 'outside' force that is present in terms of its influence. An 'outside', so to speak, that is already present within (see Massey, 2007). In that sense, JP Morgan, together with Stonepeak, are able to make their presence felt, despite the physical distances involved.

The water bills for San Diego households and global investment returns, in that respect, combine different spatio-temporalities. They do so in that the two are imbricated in one another, first, through an intensive spatiality; where the defined revenue streams of the plant and the targeted bond and equity calculations compose the financial space that combines New York and San Diego with investors in Oregon, New Mexico and further afield in Warwickshire, for instance. Such a financial space can be represented topographically, as a networked map of flattened connections, but when thought about topologically the space itself is composed by the relationships between them, the effectiveness of which may be judged by how

far the main actors are able to forge an intensive presence (Allen, 2016, Delanda, 2006). The more focussed the presence, the more likely actors like Stonepeak, will shape the agendas of the other actors involved.

Such a presence also has an intensive temporal dimension, in so far as the revenue streams that Carlsbad has to deliver are constituted through time as much as space. The unit price of Carlsbad's drinking water is not just subject to spatial forces, it is also the product of calculations made about future financial returns that are then folded into the present. These calculations reflect the demands of a future created by those who hold 10 or 15 year municipal bonds, for example, together with equity investors seduced by the prospect of double digit returns in the immediate, as well as foreseeable, future. The topologies then are emergent in the sense that outcomes cannot always be foreseeable; what contemporary finance assembles through market making is unknowable precisely because it is such a heterogeneous mix of both actors and risks (Pryke, 2017).

Such topological considerations (see also, Martin and Secor, 2013) offer a different way of thinking about Torrance's networks of global and local relations. Rather than a lattice-like web of relations criss-crossing the globe, with fixed distances and well-defined proximities, the ability of Stonepeak, in particular, to leverage their presence in ways that draw Carlsbad's San Diego actors, as well as the likes of Oregon Investment Council and a Manchester pension fund within close reach and, in doing so, make themselves indispensable to the deal, suggest that the barriers of physical distance did not restrict Stonepeak's ability to use their direct influence to hold the financial arrangement in place (see Allen, 2010).

Conclusion

The extraction of value from urban infrastructure, the means by which financial intermediaries are able to identify and capture embedded value in a toll road or desalination plant, requires a physical asset to be transformed into a liquid form.

In the recent conjuncture, new types of liquidity such as the securitisation of revenue streams or the refinancing of infrastructure debt through derivative use have illustrated the novel ways in which that transformation has taken place. Such eye-catching financial techniques can nonetheless obscure the more mundane, but no less innovative, means by which the value of infrastructure can be captured. In the case of the Carlsbad desalination plant, the transformation of a piece of drinking water infrastructure into a liquid financial asset through the restructuring of bond and equity returns over the lifetime of the project, coupled with the various fee-earning opportunities generated by the activities of fund managers, financial advisors and an investment bank, points to the skills with which long term infrastructure deals can now be financially structured to create and extract value.

It may not be what conventionally passes for financial engineering, but the construction of the deal, the translation of Carlsbad as an investment opportunity, one that generated value for bond and equity investors in the US and further afield, required that it first be broken down into its financial qualities and then put together as a series of interest payments, dividends and capital gains built into the price of water for San Diego households over the next 30 years. The value promise enshrined in that fixed term water price agreement made it possible for Stonepeak and other financial intermediaries to project and translate Carlsbad's investment qualities for pension funds, insurance companies and public investment bodies alike, bringing together and aligning previously unconnected investors across the globe. Left outside of that value promise, however, are the San Diego households who have to meet the cost of introducing private finance into the provision of their future water needs. Rather than the beneficiary of the new financing arrangements, they are effectively funding a local capital arrangement which globally benefits others elsewhere.

The circulation of embedded local value , its distribution globally, recalls Torrance's account of urban infrastructure as a form of relational investing, where geographical rates of return can be accessed from afar. Such a relational geography points to the importance of institutional actors and intermediaries being able to put together local

infrastructure deals that span the globe and, if followed through, implies that the global distances involved are also understood as relational. Rather than something to be measured in terms of miles or kilometres, distances, on this topological view, are composed through economic relationships that can be made proximate, leveraged by different actors to 'lift out' infrastructure from places like California, passed through global financial centres such as New York, and their investment qualities stretched into bond and equity markets in different parts of the world. The geography of value capture and circulation evoked here is not one that is easily mapped, but its topological spaces help us to grasp how financial intermediaries are able to exercise their influence and reach over places and actors widely distributed in both space and time.

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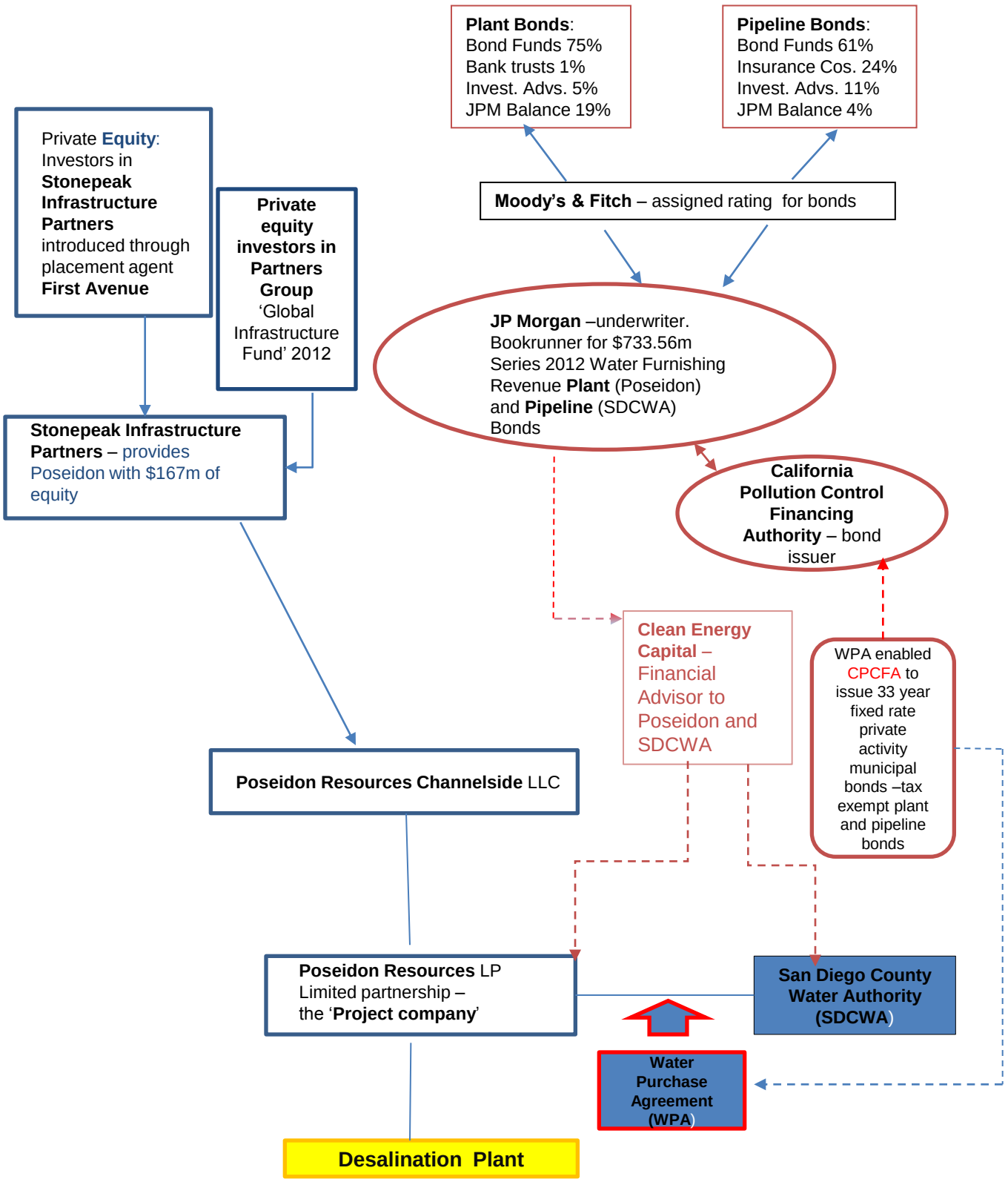
Figure 1: Financialising Carlsblad Desalination Plant

(Source: Authors, adapted/modified from CPCFABFP, 2012)



Stonepeak Infrastructure Partners (Vintage 2011)

TABLE 1

Investors as at March 2015

American Family Insurance	Insurance Company		US
Boeing Company Pension Fund	Private Sector Pension Fund		US
Greater Manchester Pension Fund	Public Pension Fund	30.0 GBP	UK
Kumpulan Wang Persaraan Public	Pension Fund		Malaysia
Massachusetts Mutual Life Insurance Company	Insurance Company		US
Michigan Department of Treasury	Public Pension Fund	75.0 USD	US
National Elevator Industry Pension Plan	Private Sector Pension Fund	25.0 USD	US
New Mexico Educational Retirement Board	Public Pension Fund	40.0 USD	US
Oregon State Treasury	Public Pension Fund	100.0 USD	US
San Diego City Employees' Retirement System	Public Pension Fund	10.0 USD	US
Teacher Retirement System of Texas	Public Pension Fund	219.0 USD	US
TIAA-CREF	Private Sector Pension Fund		US
Virginia Retirement System	Public Pension Fund	100.0 USD	US
Washington State Investment Board	Public Pension Fund	250.0 USD	US

SOURCE: PREQUIN 2014 A&C

Partners Group Global Infrastructure 2012 (Vintage 2013) (Primary, Funds of funds and secondaries)

TABLE 2

Investors as at March 2015

Cambridgeshire County Council Pension Fund	Public Pension Fund	50.0 EUR	UK
Cumbria County Council Pension Fund	Public Pension Fund		UK
Dow Chemical Company Pension Fund – Europe	Private Sector Pension Fund		Netherlands
Dutch Pension for the Healthcare Insurance Industry	Public Pension Fund	10.0 EUR	Netherlands
Fife Council Pension Fund	Public Pension Fund	25.0 EUR	UK
Gwynedd Council Pension Fund	Public Pension Fund	40.0 EUR	UK
Honda Group UK Pension Scheme	Private Sector Pension Fund	0.0 GBP	UK
London Borough of Sutton Pension Fund	Public Pension Fund		UK
North East Scotland Pension Fund	Public Pension Fund	18.0 EUR	UK
Nottinghamshire County Council Pension Plan	Public Pension Fund	12.0 EUR	UK
Suffolk County Council Pension Fund	Public Pension Fund	54.0 EUR	UK
Tyne and Wear Pension Fund	Public Pension Fund	45.0 EUR	UK
Warwickshire Pension Fund	Public Pension Fund	35.0 GBP	UK
Wiltshire Pension Fund	Public Pension Fund	50.0 EUR	UK

SOURCE: PREQUIN 2015B

Carlsblad Desalination Plant Series (2012) Water Furnishing Revenue Bonds

TABLE 3

Issuer	California Pollution Control Financing Authority	
Bookrunner	JP Morgan (for both Plant and Pipeline Bonds)	
Issuance Name	Water Furnishing Revenue Bonds, Series 2012	
Series	2012 – Plant Bonds	2012 – Pipeline Bonds
Borrower	Poseidon Resources (Channelside) LP	SDCWA
Tax Status	Tax-Exempt, AMT	Tax-Exempt, non-AMT
Ratings	Baa3/BBB	Baa3/BBB
Size	$530,345,000	$203,215,000
Bond Structure	Term Bonds: 2027, 2030, 2037, 2045	Term Bonds: 2027, 2030, 2037, 2045
Coupon	5%	5%
Yield	4.0% - 4.78%	3.18% - 4.370%
	(Bond yields vary by maturity, e.g from 4% for 2027 to 4.78% for 2045)	(Bond yields vary by maturity, eg. from 3.18% for 2027 to 4.37% for 2045)
Optional Redemption	07.01.22 at 100%	07.01.22 at 100%
Pricing Date	13th December 2012	13th December 2012

SOURCE: JP MORGAN 2013