



To: General Purposes Committee

Date: Dec. 20, 2010

From: John Irving, P.Eng. MPA  
Director, Engineering

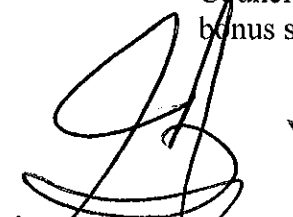
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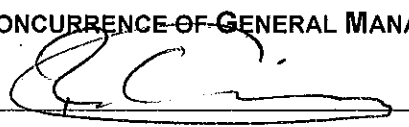
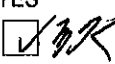

Re: Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688

Staff Recommendation

That:

1. the Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688 be introduced and given first, second and third reading, and
2. subsequent to the adoption of the Amendment Bylaw No. 8688 staff bring forward to Council an amendment to the West Cambie Area Plan that would allow for the density bonus structure outlined in **Attachment 3**.

  
 ACTING DIRECTOR FOR  
 John Irving, P.Eng. MPA  
 Director, Engineering  
 (604-276-4140)

FOR ORIGINATING DEPARTMENT USE ONLY			
<b>ROUTED TO:</b>		<b>CONCURRENCE</b>	<b>CONCURRENCE OF GENERAL MANAGER</b>
Budgets		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Sustainability Unit		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Law		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Parks Planning, Design & Construction		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Building Approvals		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Development Applications		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
Policy Planning		Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	
<b>REVIEWED BY TAG</b>	YES <input checked="" type="checkbox"/> 	NO <input type="checkbox"/>	<b>REVIEWED BY CAO</b>
			YES <input checked="" type="checkbox"/> 
			NO <input type="checkbox"/>

## Staff Report

### Origin

Council has endorsed the Alexandra District Energy Utility Bylaw No. 8641 at the Regular Council Meeting of December 13, 2010. Adoption of Bylaw No. 8641 has established the regulatory framework for the Alexandra District Energy Utility (ADEU), however the service area defined therein encompasses only the two Oris developments, the Remy and Alexandra Gate.

The purpose of this report is to introduce the proposed Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688 (**Attachment 1**) for 1<sup>st</sup> to 3<sup>rd</sup> readings. This amendment will expand the ADEU service area to the majority of the Alexandra Neighbourhood.

This initiative aligns with Council's Term Goal #7 that states:

***“Sustainability and the Environment – Demonstrate leadership in and significant advancement of the City’s agenda for sustainability through the development and implementation of a comprehensive strategy that among other objectives includes incorporating sustainability into our City policies and bylaws”.***

### Analysis

The air conditioning requirements of the OCP aircraft noise section that are applicable to West Cambie make district energy and specifically geothermal technology applicable as the ADEU can provide cooling for minimal additional capital cost. The proposed ADEU expansion would directly support the West Cambie Area Plan sustainability guidelines stated as follows:

“8.4 Alexandra’s Building Sustainability Guidelines - “Sustainability features of building design may be incorporated in many ways, including: a green roof or any strategy that assists in storm water management, enhanced biomass and energy efficiency; reduction of greenhouse gas (GHG) emissions through energy systems that result in lower greenhouse gas emissions and improved building mechanical systems,

8.4.1 Energy and Water Use - Design teams will be required to identify ways in which they are accomplishing optimal energy (e.g. heat, light, etc.) and water use in site planning and building design.”

### *Proposed Bylaw Amendment*

The proposed Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688 is a replacement of the Schedule A service area map that will expand the ADEU service area to the majority of the Alexandra Neighbourhood where future serviceable multi-family residential and commercial development is anticipated.

## ADEU Expansion Potential

To leverage economies of scale and realize the long-term social, economic and environmental benefits of the ADEU, expansion to service future development is critical. Some of the benefits of scale are as follows:

*Distribution Piping Efficiency* – A given length of distribution piping can service one side of the street or two sides (more development) at almost the same cost. Also doubling the size of a given length of pipe to service twice the demand only marginally increases the full cost of that pipe installation.

*Peak Load Balancing* – A single home may have its furnace on or off, representing a range of output from zero to 100%. Of course the furnace has to be sized to meet the highest demand (100%) even though for much of the time it will be off. As more units are added to a single system, that system can be more economically sized as the probability of everyone requiring peak demand simultaneously decreases. Other building types such as commercial and institutional also have different demand patterns, so adding these to a residential system creates further efficiencies.

*Waste Heat Capture* – Some industrial, commercial and retail uses actually generate significant waste heat from air-conditioning and chilling activities. With an expanded DEU this waste heat can be captured and used to meet heating demand, resulting in further reductions in system sizing and potential GHG reductions

*Fuel Switching* – The DEU essentially places a larger district or neighbourhood on one system, and it is relatively simple to switch the energy generation technology in that system when more economic technologies are available.

*Energy Security* – Establishing a local source of energy supply for a neighbourhood greatly increase the security of supply as dependency on remote generation and supply chains are decreased.

*GHG Reduction* – The proposed first phase of the DEU moves an on-site geothermal energy system onto City-owned property. This does not result in any greenhouse gas emission reductions immediately but does provide the infrastructure for future system connections which would reduce greenhouse gas emissions (e.g., capture and use of waste heat, displacement of conventional energy systems, etc.)

The ADEU concept and preliminary design work completed to date identifies the highest returns on energy efficiency and capital occur with higher density development and high demand users. With respect to planned building forms in the Alexandra neighbourhood, there is currently not a strong business case to service townhouses and smaller stand-alone retail units. Therefore for the purposes of defining ADEU expansion potential, staff have identified serviceable unit numbers and building areas that do not include the lower density forms.

The approximate quantities of ADEU serviceable units and building area for the undeveloped portion of the Alexandra Neighbourhood are broken down in the following tables:

<b>Servicable Residential</b>	Units	Building sq.ft. (millions)	Percent
<i>Oris</i>	453	0.36	15%
In Process	848	0.82	27%
Future	1811	1.63	58%
<b>Total</b>	<b>3112</b>	<b>2.81</b>	<b>100%</b>

<b>Servicable Non- Residential</b>			
<i>Oris</i>		0.01	1%
In Process		0.40	36%
Future		0.70	63%
<b>Total</b>		<b>1.10</b>	<b>100%</b>

The Oris developments (Remy and Alexandra Gate) represent 15% of the residential and 1% of the non-residential square feet of serviceable building that is anticipated for the Alexandra Neighbourhood under the current OCP. The remaining in-stream and future developments represent 85% of residential and 99% of non-residential totals.

In terms of combined building square feet, Oris represents 360,000 sq.ft. while in-process and future development represents 3.9 million sq.ft. Therefore expansion of the ADEU service area as proposed in the Amendment Bylaw No. 8688 represents an approximate ten-fold increase in the size of the utility over the first phase.

The ADEU expansion is anticipated to support the achievement of significant ecological health benefits at a broader scale (more local energy systems means lower expansions of centralized systems, greater opportunity to re-use waste and greater efficiencies which again reduce resource consumption). Based on preliminary calculations, use of the ADEU for heating and cooling of the Remy and Alexandra's 453 units will result in an estimated avoidance of 200 to 600 Tonnes of GHG generation annually. At full build-out of the proposed expanded service area, the potential avoidance of GHG generation would be 2,000 to 6,000 Tonnes annually, which is equivalent to removing 700 to 2,000 vehicles from the road.

#### *Proposed Expansion Preliminary Concept Design*

Staff engaged Hemmera Energy Ltd. to complete preliminary concept design work for the Alexandra District Energy Utility (ADEU). The first phase of the ADEU will use ground source heat pump (GSHP) technology for the primary renewable energy source. Underground well and piping infrastructure will be sited on park land between Odlin Rd and Cambie Rd. (the Greenway) and the Energy Centre building would be sited on park land south of the Greenway.

The design concept for the future build-out of the ADEU includes two distribution pipe loops that would service the northern and southern areas of the neighbourhood and expansion of the Energy Centre building.

There exists the potential to expand the geothermal well-field through parkland, road rights-of-way, or other publicly held lands to service the fully expanded ADEU, however the best technology and configuration would be defined through analysis at each expansion phase. Renewable energy source options to be considered would include open-loop geothermal, biomass, sewage heat recovery, and interim high efficiency gas boilers.

*Consultation*

Staff have consulted with UDI, local landowners and developers and the City’s Advisory Committee on the Environment. Copies of Bylaw No. 8641 and the preliminary concept design report have been distributed to these groups for review and comment. The main concern identified to date is the potential for increased construction costs resulting from the need to install DEU compatible in-building systems. Issues and responses are summarized as follows:

Stakeholder	Issue Raised	Response
Developers and Landowners	Installing in-building hydronic systems that are DEU compatible represents an increased construction cost over conventional systems	Staff have identified options for addressing this in the following section.
Developers and Landowners	Will the ADEU be as reliable as conventional electric and gas energy sources?	The geothermal technology is proven and will have back-up systems in place to maximize continuous performance. DEU systems typically have lower failure rates than gas and electrical systems.
Developers and Landowners	The flat rate service charge defined in the current bylaw does not provide the opportunity for customers to save through conservation.	The flat rate as adopted in the current ADEU Bylaw is intended to be a temporary “placeholder” rate that provides certainty of cost to new users. After a short monitoring of the first phase system, staff will bring forward options for amended rate structures that would include variable kilowatt-hour charges.
SmartCentres	Retail and commercial leasees are accustomed to direct metering and energy billing.	Staff are continuing to work with SmartCentres and consultants on defining the optimal servicing strategy for the various users that could exist on the SmartCentres site. The current ADEU Bylaw permits a variety of servicing configurations, however should an acceptable solution be defined that would not be permitted under the current bylaw, an amendment would be brought forward for Council’s consideration.

### *In-Stream Applications*

There are six active rezoning applications at various stages of processing (listed in **Attachment 2**) within the proposed ADEU expanded service area. The in-stream developers purchased the properties and significantly advanced development concepts as part of their applications. The addition of the cost of ADEU represents an unforeseen development cost and it is reasonable to find ways to at least partially off set the increased cost for those developers with projects in-stream.

In the absence of a regulated service area, Planning staff have been negotiating commitments from developers to be serviced from the ADEU and have been accelerating application processing for those that commit. While consultation on the ADEU concept has been ongoing for 6 months, the proposed bylaw amendment will be effective immediately upon adoption at 4<sup>th</sup> reading. At that point ADEU servicing would be mandatory for any applicable development without a building permit, impacting those developers that have in-stream development applications.

There are various in-building hydronic systems that a developer can choose which are compatible with ADEU servicing. The additional construction cost to install any given hydronic system over the cost to install conventional heating and cooling systems will therefore vary depending on the specific hydronic system chosen. Additional construction costs estimates have ranged from \$1,500 to over \$5,000 per residential unit.

Four options for mitigating this cost impact to those with in-stream applications are presented for consideration as follows:

#### Option 1 -- No Mitigation (Not Recommended)

Under this option there would be no consideration of financial or other relief provided to developers with in-stream applications. Other established DEU's such as Lonsdale Energy Corporation and the South-East False Creek Neighbourhood Energy Utility have not compensated developers for additional in-building costs. The recommendations in this staff report do not include any mitigation for those properties that do not have a development application in-stream.

There is long term value accrued to the ADEU from servicing as much development as possible within the servicing area as early as possible, hence the staff recommendation to adopt the proposed bylaw amendment. In consideration of the impacts to in-stream developments created by bringing this amendment forward in a timely manner, Option 1 is not recommended.

#### Option 2 – Revise Development Cost Charges (Not Recommended)

Development Cost Charges (DCCs) are levied to fund the construction of infrastructure necessary to support development. The City cannot waive DCC charges established in the DCC Imposition Bylaw. The DCC program could be revised to permit some benefit, however this would require revision to the bylaw which is a lengthy process that ultimately requires Provincial approval. Any reduction in DCC income would restrict the City's ability to deliver the necessary capital program.

Developers also receive DCC credits for the construction of DCC works under servicing agreement. In many cases these credits can exceed the DCC charges, so there is effectively no remaining DCC charge left to lower. This would create variable benefit to each developer depending on the extent of DCC works they are required to construct. For these reasons revising the DCCs is not recommended.

Option 3 – Refund of Sewer Charge (Not Recommended)

In 2007 the City entered a “latecomer” agreement with Polygon under which the City and Polygon are constructing storm and sanitary sewer works that benefit lands in the Alexandra Neighbourhood, and the costs of these works are recovered through benefit charges applied to new developments in the area.

A key component of these works currently being constructed by the City is the No. 4 Rd Drainage Pump Station. This project is fully funded through the capital program but has also received grant support through the Federal/Provincial Flood Protection Program. The value of this grant is ultimately dependent on approved eligible costs, but is currently estimated to be \$2 Million or greater.

The City’s portion of the benefit charges could be refunded to a total amount equivalent to the grant with no impact to the works program or the front-ender agreement, however this refund would have to be distributed to all developments within the benefit area that develop within the agreement term (15 years).

This would result in a refund amount of approximately \$600 per residential unit and \$0.40 per sq.ft. of commercial building as shown in the following table:

	Benefit Charge	Proposed Refund Amount	Est. Total Value of refund for the 6 in-stream applications
Multi-family	\$1,836.72 + interest per unit	\$600 per unit	\$498,000
Commercial	\$1.24 + interest per sq.ft.	\$0.40 per sq.ft.	\$156,000
Total			\$654,000

The impact of the refund at this level is low, and with the benefit distributed to all future development in the Alexandra Neighbourhood, there is no relative benefit to the in-stream applicants. For these reasons Option 3 is not recommended.

#### Option 4 -- Unit Owner Grant (Not Recommended)

The ultimate owners of the constructed units could be awarded a City grant valued at \$2,000 per unit. The grant would be provided to owners at the time of occupancy. Corporations or other business entities would not be eligible for the grant, only individual persons who are unit owners.

There is \$6 M in available borrowing from the water utility reserve of which \$4 M is allocated to the ADEU 1<sup>st</sup> Phase construction. The remaining \$2 M could be used to fund the \$2,000 unit owner grant. The total number of potential eligible units would be approximately 900, therefore the total grant program cost would be \$1.8 M. Based on current known developer schedules, the grants would be likely be paid out over a period of 3 to 6 years. The borrowed amount plus interest would be repaid to the water utility reserve from ADEU revenue or other non-City grant sources.

The unit owner grant would only be of indirect benefit to developers as this value would have to be realized through potential increased unit value and marketability.

#### Option 5 -- Density Bonus (Recommended)

Density bonuses are of significant value to most developers in that additional units can be constructed and sold on the same land base. Staff could bring forward to Council for consideration an amendment to the West Cambie Area Plan that would provide increased density bonuses for the in-stream applications.

The proposed density bonus structure is outlined in **Attachment 3** that would raise allowable floor area ratios (FAR's) up to 4%. This level of proposed increase has been calculated to provide value equivalent to the value that would be provided under Option 3 -- Refund of Sewer Charge. Staff have reviewed the proposed small increase in density and find that in all cases it can be deployed without changing the overall built form and character of the West Cambie Plan.

While the 5 residential and commercial projects would benefit from this bonus, the FNDA (Ismaili Jamatkhana) application would not because the Area Plan allows a maximum FAR of 1.25 and their project is at 0.14, so they are not close to fully using their currently available density. Given this situation, in this one particular case staff recommend that the City reimburse engineering costs related to FNDA district energy up to \$50,000.

Developers who choose to take advantage of the density bonus outlined herein, will be asked to enter into agreements that would, in addition to the bylaw, contractually commit the developer to hook-up to the ADEU. Also, in order to take advantage of the density bonus, rezoning bylaws may need amendment and, depending on the stage of the rezoning application, an additional public hearings may be required.

Should the proposed bylaw amendment be supported, it is recommended that staff be directed to bring forward an amendment to the West Cambie Area Plan to provide the density bonus structure outlined in **Attachment 3**.



## Financial Impact

Expansion of the ADEU service area will create future capital funding requirements for additional ADEU infrastructure as well as generate return on investment.

\$4 M for the ADEU 1<sup>st</sup> Phase has been allocated in the 2011 Capital Budget. This \$4 M is funded from a total of \$6 M in available borrowing from the water utility reserve. Based on the known development schedules of in-stream applications, it is likely that the total \$6 M will be sufficient to fund any required 1st Phase expansion of the ADEU through 2011.

All development schedules are ultimately controlled by developers, projects are advanced or halted at various stages depending on market conditions and a variety of business considerations. At the current pace of development it is estimated that the Alexandra Neighbourhood could be fully developed by 2020, as shown in the following table:

	Building sq.ft.	Est. Occupancy Dates
Oris Developments (Remy and Alexandra Gate)	0.36 M	2011-2013
In-stream applications	1.21 M	2012-2016
Future buildable	2.32 M	2013-2020

Additional capital funding would be required in 2012 and beyond for additional expansion phases that would occur in step with development. Through extrapolation of the 1<sup>st</sup> phase costs, the total additional capital cost to build-out the ADEU is estimated at approximately \$24 Million in 2010 dollars, which would bring the total estimated capital cost of the ADEU to \$30 Million. The timing of these capital expenditures would depend on the development schedules, but is currently estimated as shown in the following table:

	Est. year of implementation	Est. Capital Cost (2010 dollars)	Cumulative total sq.ft. of buildings serviced
1 <sup>st</sup> Phase	2011-2012	\$6 M (funded)	0.7 M sq.ft.
2 <sup>nd</sup> Phase	2014	\$6 M	1.4 M sq.ft.
3 <sup>rd</sup> Phase	2017	\$10 M	2.7 M sq.ft.
4 <sup>th</sup> Phase	2020	\$8 M	3.9 M sq.ft.
<b>Total</b>		<b>\$30 M</b>	<b>3.9 M sq.ft.</b>

As with the 1<sup>st</sup> phase capital costs, all of these costs would be ultimately recovered through user rates and charges.

As additional phases are identified in detail, funding opportunities would be explored and brought forward to Council for consideration. Future funding sources could include provisional account allocation, borrowing from accumulated reserves, or grant funding, however at this stage these funding sources are either limited or uncertain.

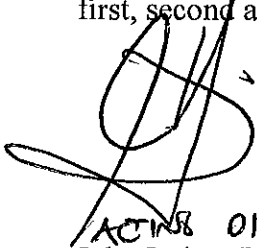
Given that the ADEU will generate revenue and have full cost recovery over time, debt financing of future capital costs will likely be the most prudent and viable strategy. Long-term debt financing can be implemented by the City through approval by the electors and the Inspector of Municipalities or directly through a wholly City owned corporate entity. A financial analysis of the full build-out based upon debt financing to fund future capital infrastructure for expansion of the ADEU (based on the estimated schedules above and debt financing of future phases) is provided in **Attachment 4**. This analysis estimates a 14 year payback on the initial capital investment with a rate of return above 12%.

The financial analysis provided in Appendix 4 represents future-oriented financial information, which contains assumptions and estimates that are based upon current information available and known to staff at this time. These assumptions reflect current business and economic conditions and planned courses of action that staff believes to be the most probable. However, as with all such assumptions, there is a measure of uncertainty surrounding them. This uncertainty increases as the forecast horizon extends. Therefore, the actual results achieved for the fiscal years covered in the accompanying future-oriented financial information will vary from the information presented, and the variations may be material.

At the appropriate time when capital funds are required for expansion of the ADEU, staff will bring forward a report to Council with funding alternatives and recommendations.

**Conclusion**

Expansion of the ADEU will represent one of the most significant advancements to date towards meeting the City’s sustainability and GHG reduction goals. It is recommended that the Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688 be introduced and given first, second and third reading.



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Director, Engineering  
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Jl:jp  
Att: (4)

**Attachment 1 – Proposed Alexandra District Energy Utility Bylaw No. 8641 Amendment  
Bylaw No. 8688**



Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688

The Council of the City of Richmond enacts as follows:

- 1. Alexandra District Energy Utility Bylaw No. 8641, is amended by deleting Schedule A in its entirety and substituting Schedule A attached to and forming part of this bylaw.
2. This Bylaw is cited as "Alexandra District Energy Utility Bylaw No. 8641 Amendment Bylaw No. 8688".

FIRST READING

SECOND READING

THIRD READING

ADOPTED

MAYOR

CORPORATE OFFICER

CITY OF RICHMOND APPROVED for content by originating Dept. APPROVED for legality by Solicitor



**Attachment 2 – In-Stream Applications**

Rezoning Application	Address	Project Description	Applicant	Project Status
RZ 08-410760	9411/9371 Alexandra Rd	139 dwelling units and 369m <sup>2</sup> of commercial space	0797460 BC LTD	RZ & DP adopted  BP not yet submitted
RZ 04-270168	9560/80 Cambie Rd 9531/51/71 Odlin Rd	Assembly Use for Ismaili Temple	FNDA	RZ bylaw @ 3 <sup>rd</sup> Reading
RZ 09-453123	9340, 9360, 9400 Odlin Rd	221 dwelling units	Paul Goodwin GBL Architects	RZ bylaw @ 3 <sup>rd</sup> Reading
RZ 10-528877	4660, 4680, 4700, 4720, 4740 Garden City Rd, 9040, 9060, 9080, 9180, 9200, 9260, 9280, 9320, 9340, 9360, 9400, 9420, 9440, 9480, 9500 Alexandra Rd	32,860m <sup>2</sup> 353,700 ft <sup>2</sup> commercial floor area	Smart Centres	Staff Review  Not ready to move forward to PC
RZ 10-537689	9331/9351/9371/9391 /9411 Odlin Rd	approx. 359 dwelling units	Polygon	RZ Bylaw @ 1 <sup>st</sup> reading.  Scheduled for Dec 20 Public Hearing
RZ 10-534751	9251/9291 Alexandra Rd	approx 131 dwelling units and 381m <sup>2</sup> of commercial	Fred Adab Architecture	Staff Review  Very close to moving forward to PC

### Attachment 3 – Density Bonus

As a proposed method for partially offsetting the in-stream developers' costs of providing in-building ADEU compatibility, the density bonus structure is outlined in this attachment.

- Background:
  - Land values in West Cambie for lands permitting residential use is \$90 psf of site area.
  - At FARs of 1.5, this equates to \$60 psf buildable, and at 1.7 FAR \$53 psf buildable.
  - See the example below in mathematical sequence.
  - If we assume, for example, that Polygon is building to 1.7 FAR, then at their "sewer benefit charge" of \$657,546 and at a buildable land rate of \$53 psf then the additional square footage they need to cover the refund is 12,407 sf.
  - Based on the total proposed project before bonus of 351,000 sf, the additional square footage is an increase of 3.53%, thus the total FAR with bonus would be 1.76.
  - There is a negligible difference in percentage increase required dependent on the actual FAR being proposed.
  - Therefore, a suggestion may be to simply provide a 3.75% to 4% increase in density to account for any arguments regarding land value - current versus what they paid for the land, thus the base 1.7 FAR becomes 1.768.
  
- The incentive will apply only to the in-stream projects listed in **Attachment 2**. The proposed bonus would result in new FAR allowances as follows:

In Process	Approved/ Proposed FAR	Additional Square Footage	New Total FAR
<b>Residential</b>			
- Paul Goodwin Architects	1.7	7,624	1.76
- 0797460 BC Ltd	1.6	4,627	1.66
- Polygon	1.68	12,275	1.74
- Fred Adab Architecture	1.5	4,095	1.55
<b>Commercial</b>			
- SmartCentres	0.61	3,026	0.615

Developers who choose to take advantage of the density bonus outlined herein, will be asked to enter into agreements that would, in addition to the bylaw, contractually commit the developer to hook-up to the ADEU. Also, in order to take advantage of the density bonus, rezoning bylaws may need amendment and, depending on the stage of the rezoning application, an additional public hearings may be required

**Attachment 4 - Financial Analysis for Build-Out of ADEU to service 3.9 million sqft**

	Year (Date) Year (Count)	2010	2011	2012	2013	2015	2018	2021	2040
		0	1	2	3	5	8	11	30
<b>Initial Capital Outlay</b> (\$6 M borrowed from water utility reserve)			(\$ 3,200,000)	(\$2,800,000)	\$ -	\$ -	\$ -	\$ -	\$ -
<u>Revenue:</u>									
Sq ft. Serviced (max 3.9 million)		-	180,000	363,000	715,000	1,400,000	2,740,000	3,907,000	3,907,000
User Fee per Sq ft. Serviced		\$ 0.96	\$ 0.96	\$ 1.00	\$ 1.04	\$ 1.12	\$ 1.26	\$ 1.42	\$ 2.99
Annual Revenue		\$ -	\$ 86,400	\$ 271,066	\$ 559,663	\$ 1,403,830	\$ 3,120,337	\$ 5,551,982	\$ 11,697,188
<u>Expense:</u>									
Op. Exp as % of Revenue					50%	50%	50%	50%	50%
Annual Expense		\$ -	(\$ 60,000)	(\$ 100,000)	(\$ 279,832)	(\$ 701,915)	(\$ 1,560,169)	(\$ 2,775,991)	(\$ 5,848,594)
Annual Net Revenue		\$ -	\$ 26,400	\$ 171,066	\$ 279,832	\$ 701,915	\$ 1,560,169	\$ 2,775,991	\$ 5,848,594
Oris Revenue Share Payment									
Phase 2 - \$6 M (2010 \$) Debt Repay			(\$ 13,200)	(\$ 85,533)	(\$ 136,541)	(\$ 147,683)	(\$ 166,123)	(\$ 186,866)	(\$ 393,699)
Phase 3 - \$10 M (2010 \$) Debt Repay						(\$ 476,000)	(\$ 476,000)	(\$ 476,000)	(\$ 476,000)
Phase 4 - \$8 M (2010 \$) Debt Repay						(\$ 791,000)	(\$ 791,000)	(\$ 791,000)	(\$ 791,000)
Total Annual Debt Repayment		\$ -	(\$ 13,200)	(\$ 85,533)	(\$ 136,541)	(\$ 623,683)	(\$ 1,433,123)	(\$ 2,083,866)	(\$ 2,290,699)
Net Annual Cash Inflow (Outflow)		\$ -	(\$ 3,186,800)	(\$2,714,467)	\$ 143,290	\$ 78,232	\$ 127,045	\$ 692,125	\$ 3,557,896
Cumulative Cash Inflow (Outflow)		\$ -	(\$ 3,186,800)	(\$5,901,267)	(\$5,757,977)	(\$ 5,331,757)	(\$ 4,392,420)	(\$ 2,149,032)	\$ 36,318,008
Discount Rate		5%	5%	5%	5%	5%	5%	5%	5%
PV of Cashflow		\$ -	(\$ 3,035,048)	(\$2,462,102)	\$ 123,780	\$ 61,297	\$ 85,989	\$ 404,671	\$ 823,217

<b>NPV of Inv. Over Asset's Life</b>	\$12.8 M
<b>Payback Period</b>	14 years
<b>Internal Rate of Return</b>	12.25%

<b>Assumptions:</b>
Interest rate on debt: 4.5%
Term: 25 yrs
Rate Increase: 4% per year