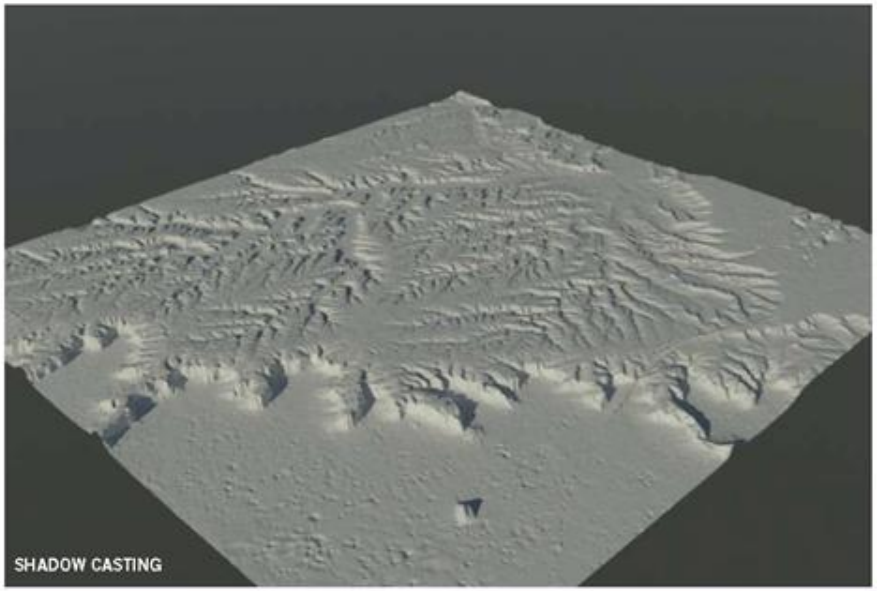
Urban Information Modeling

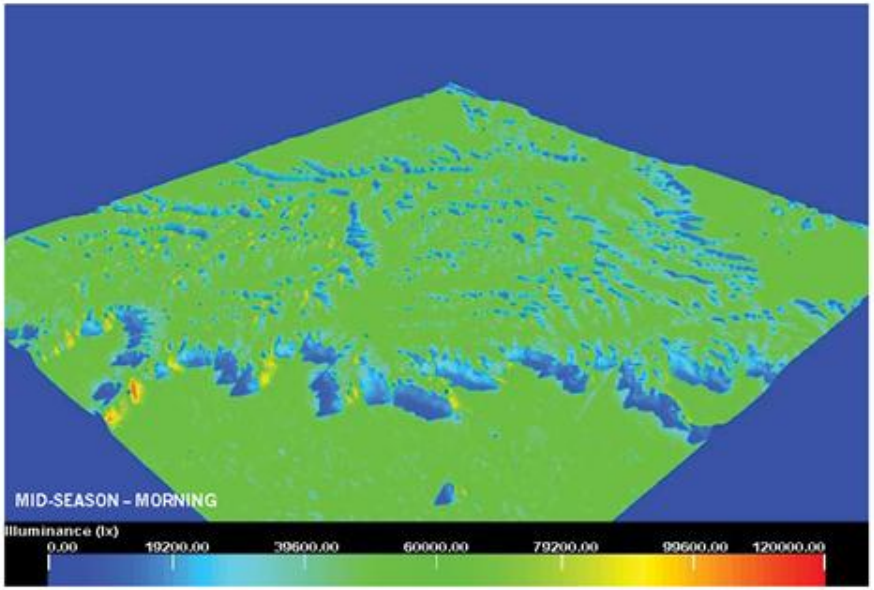
Towards an Information-Centric Theory of Cities and Urban Sustainability

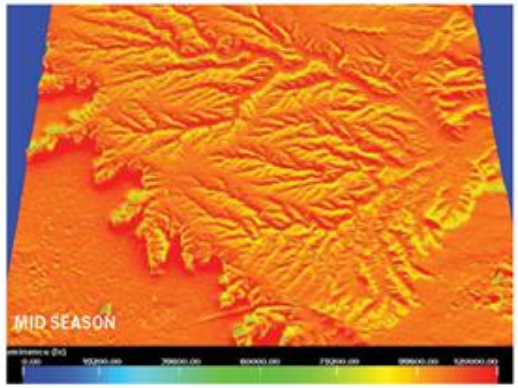
Symposium on Sustainable Urban Design - Case Studies and Design Workflows
Massachusetts Institute of Technology May 6, 2013

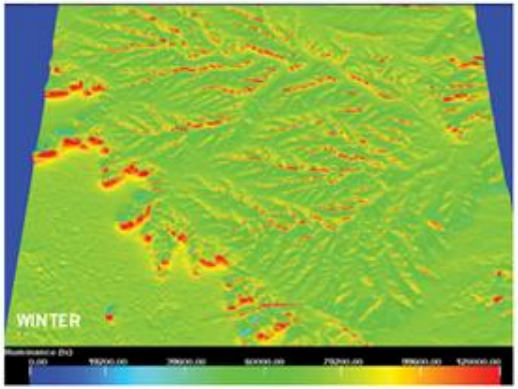
SOM

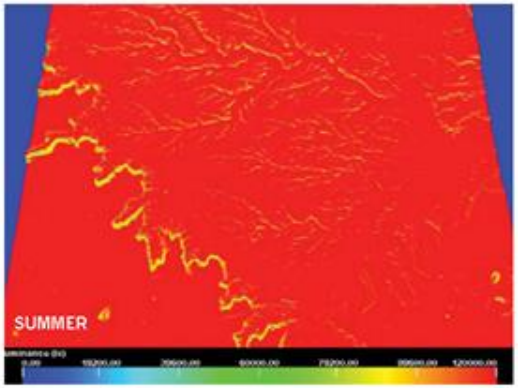
Urban Analytics











Solar Exposure

SITE MICROCLIMATE

The site microclimate is governed by an interaction between site and local conditions of the summit, wadis and slope orientation. The initial assessments were carried out on the base line conditions, while more detailed assessments were carried out at a local level. This detailed understanding of environmental conditions helped the design team to select the development site and optimize building massing and orientation as well as inform the selection of alternative sources of energy for the site. The microclimate assessment also aided in informing the development and deployment of landscape, specifically tree shelters, around the proposed Master Plan.

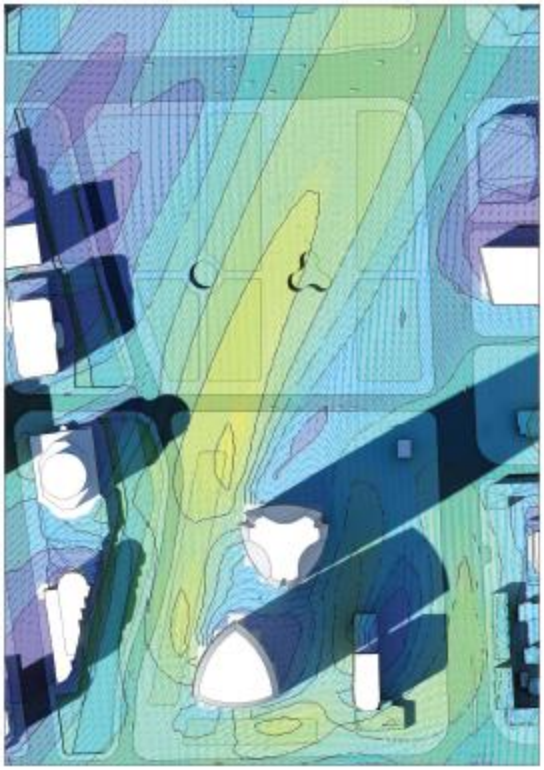
SOLAR EXPOSURE

Shadow cast and solar radiation studies were carried out for the whole site for three different seasons. Results from these analyses were used to identify areas of low solar gain. The assessment indicated that due to the exposure of the site to the sun there is a large potential for solar energy (solar cells, solar water heating, etc). The results show that building and street orientation, need to be optimized to reduce solar gain. The reduction in solar gain will provide a better external environment and reduced cooling loads during the hottest months of the year.

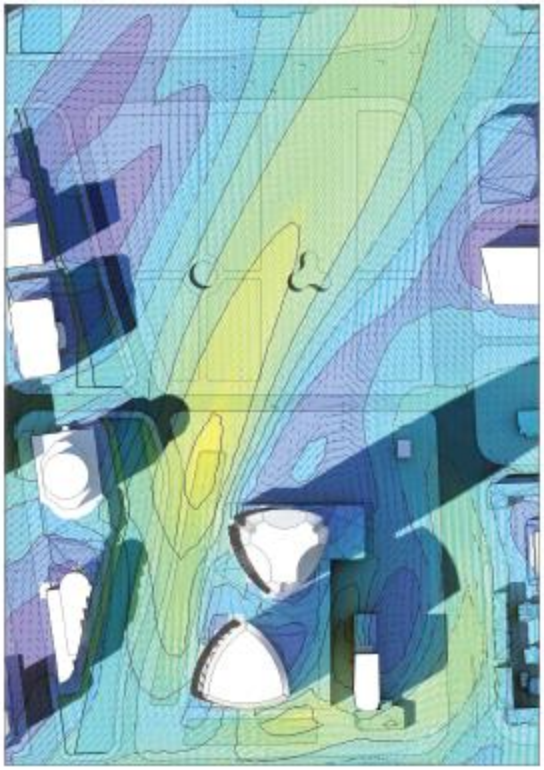
The KA-CARE site is very different from central Riyadh. We have assessed the site microclimate in detail. High resolution shadow casting has been used to identify areas of low solar gain.

西南风(裙房)
SOUTHWEST WIND FLOW (PODIUM)

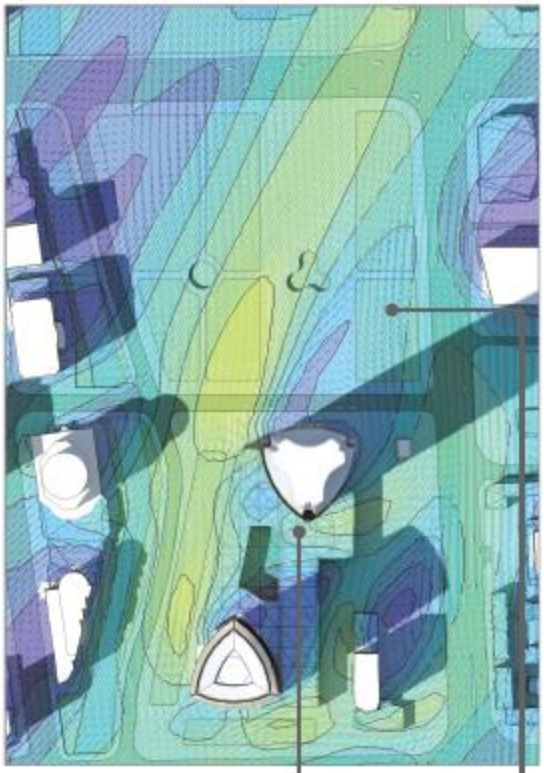
总体规划
MASTER PLAN



基本条件
BASE CONDITION

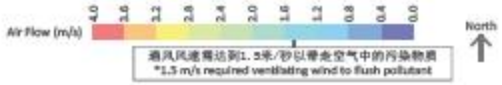


修改后的塔楼位置
REVISED TOWER POSITION



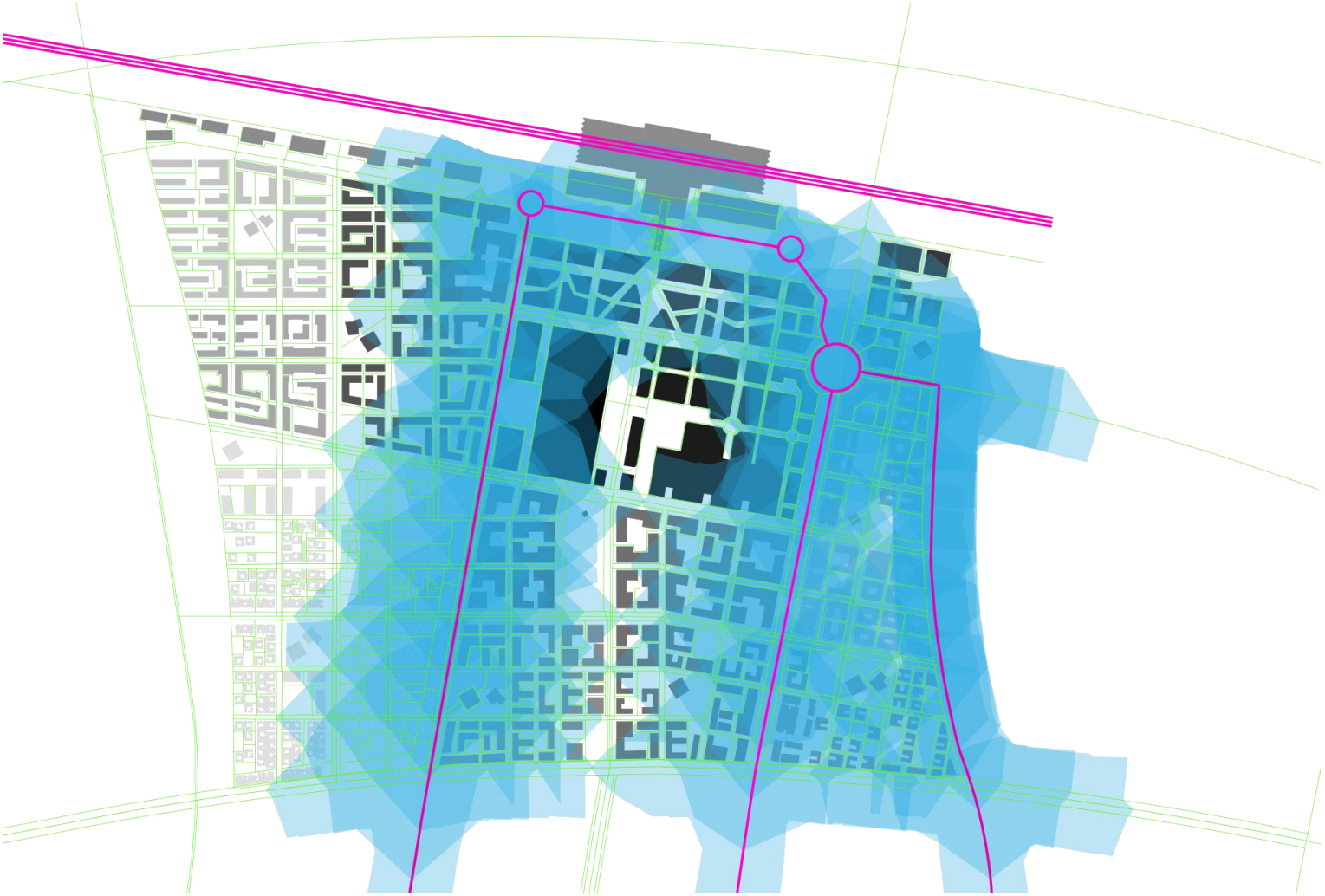
塔楼之间的间距越大，裙房屋顶处的通风越好
The greater the spacing between the towers, the better the ventilation at the podium roof

增加办公塔楼顺风向风速，加强了自然通风
Increased wind speeds downwind of the office tower improves natural ventilation

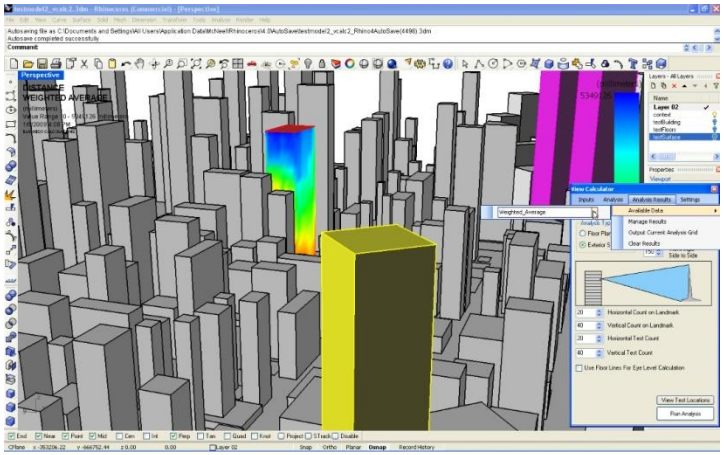


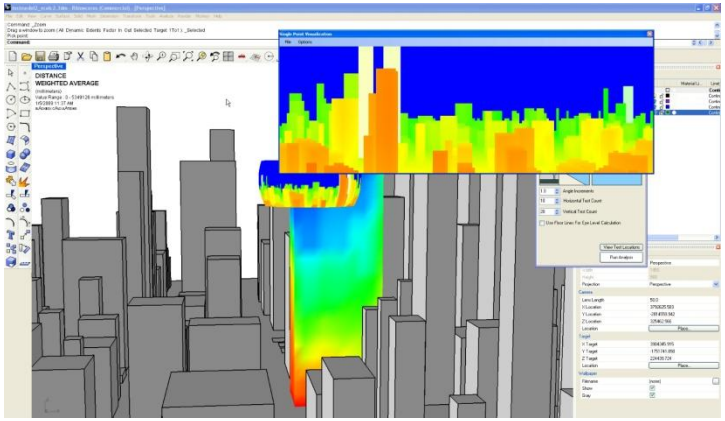
PUBLIC TRANSPORTATION COVERAGE

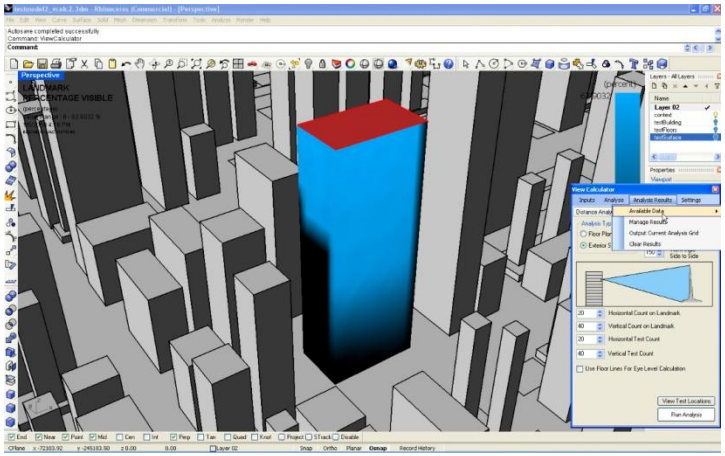
Percentage of floor area within 400m walk-shed



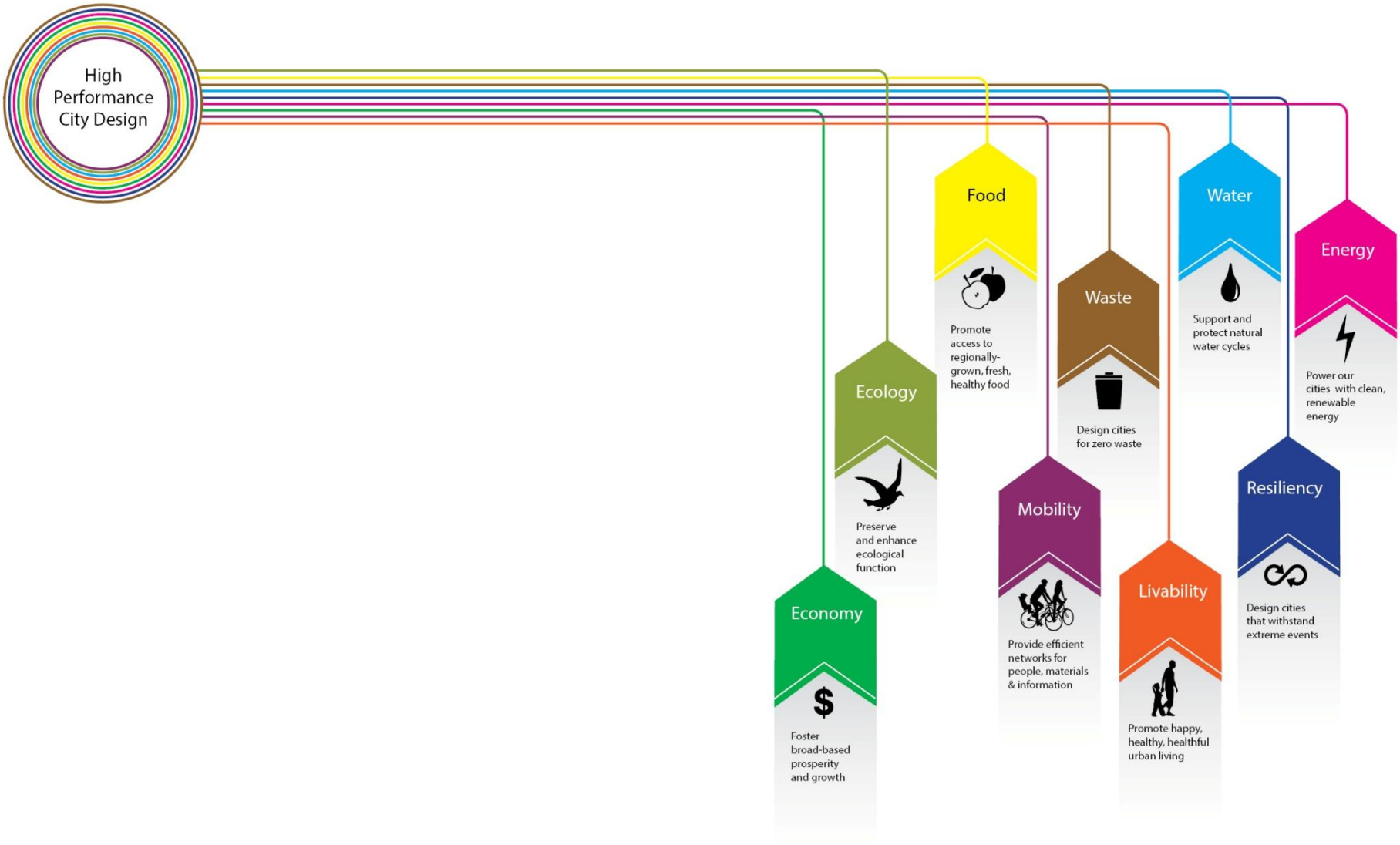
TARGETED: 100% ACHIEVED: 76.1% GAP 23.9%


Perspective
DISTANCE
WEIGHTED AVERAGE
View Calculator


Perspective
DISTANCE
WEIGHTED AVERAGE


Perspective
LANDMARK
PERCENTAGE VISIBLE
View Calculator

High Performance Design



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SOM HPD
City Design Practice

PROJECT PROFILE: a visual & interactive dashboard *(Draft)*

ECOLOGY

RESILIENCY

FOOD

ECONOMY

MOBILITY

LIVABILITY

WATER

ENERGY

WASTE

Project **204311**

Lakeside Chicago

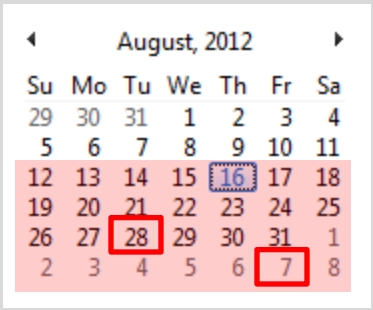
Location: Chicago, USA
Offices: Chicago
Site area: 586 acres (3,600 ha)

Staff: Aaron May
Person one, Person Two, Person Three, Person Four
Consultant: Ramboll, WSP, CISCO, Clean Energy Trust, Spaceco.

Summary

+ Research
+ Strategies
+ Indicators
+ Management

Calendar



RA
CMP
DMP
DG

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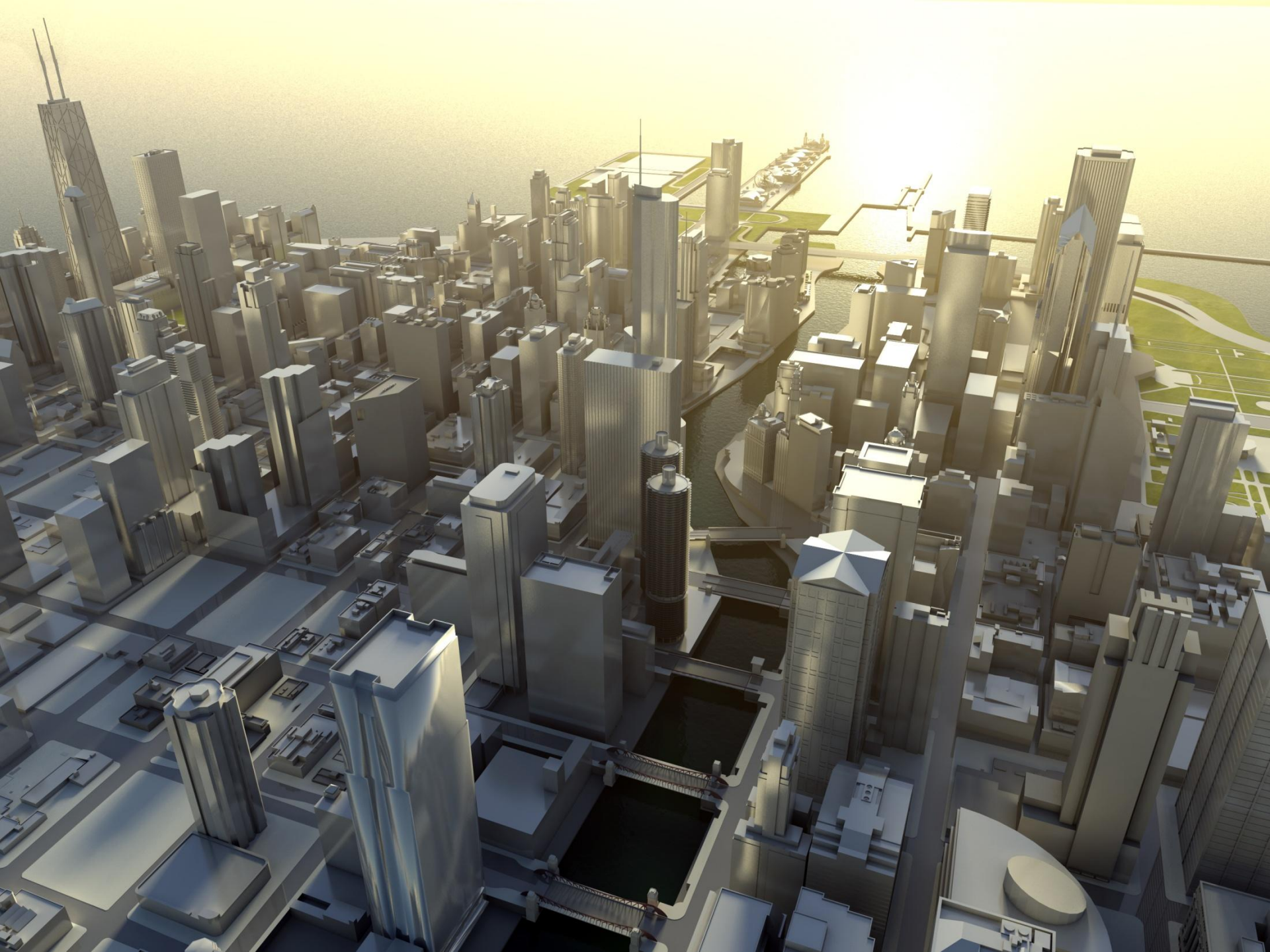
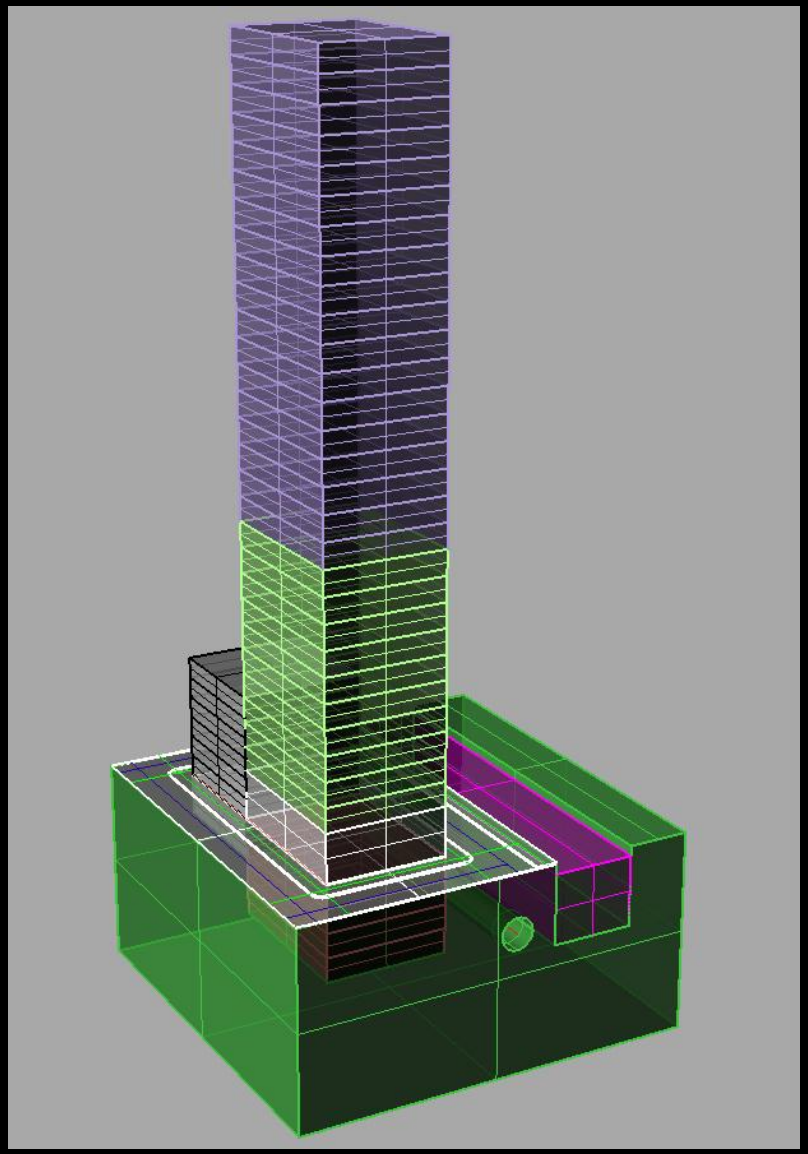
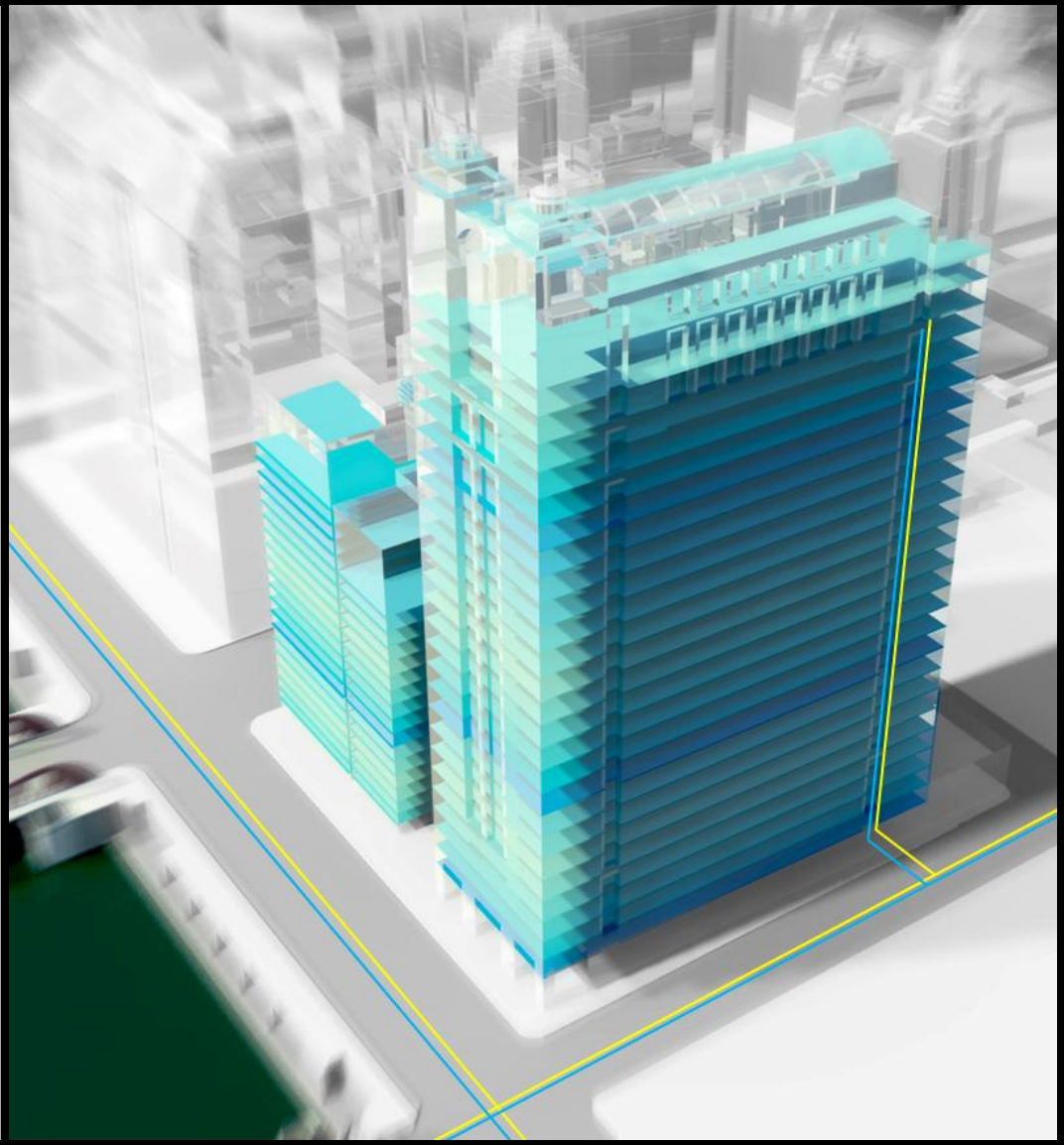
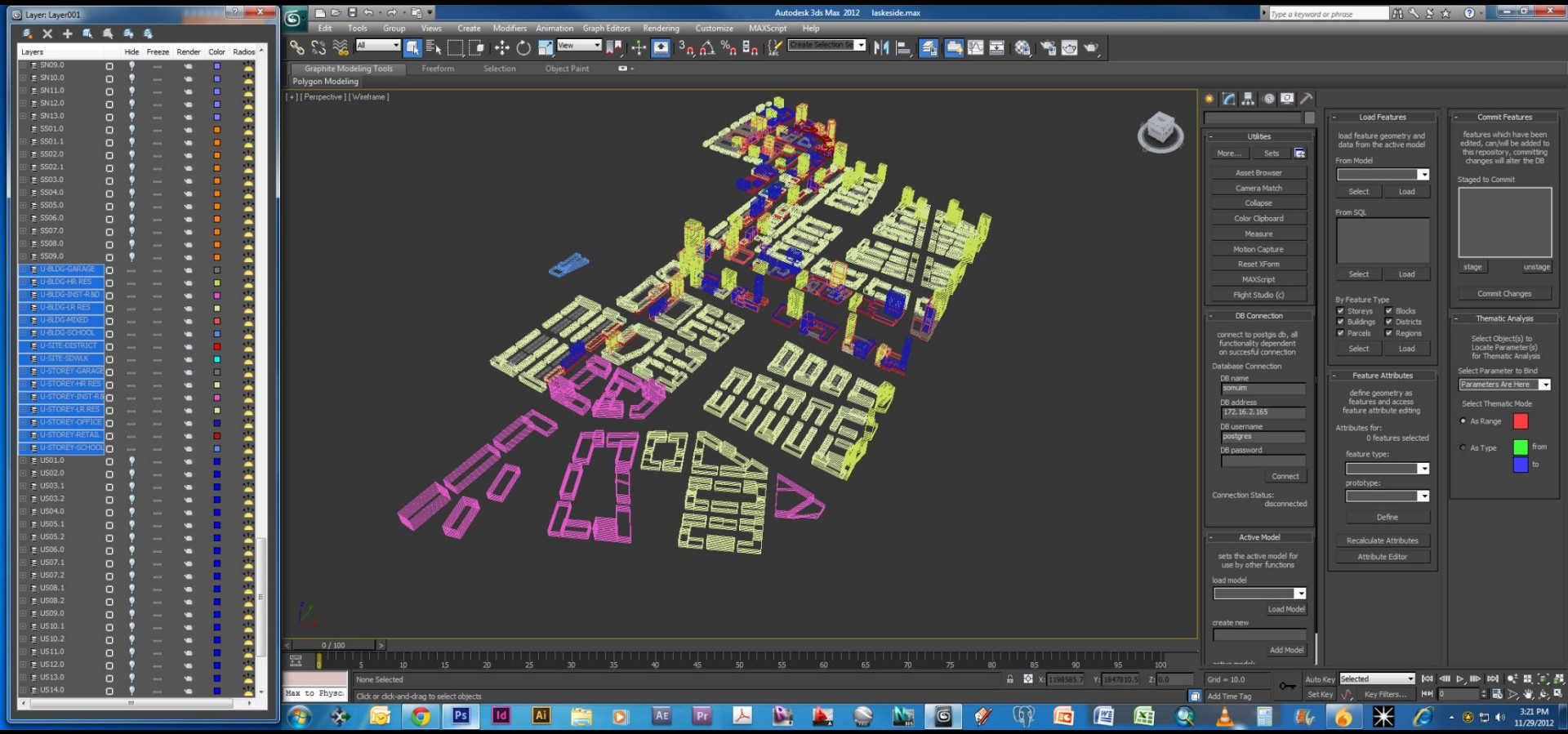
Smart Urban Models





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SS05.0
SS06.0
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SS08.0
SS09.0
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U-BLDG-HR RES
U-BLDG-INST-R&D
U-BLDG-LR RES
U-BLDG-MIXED
U-BLDG-SCHOOL
U-SITE-DISTRICT
U-SITE-SDWLK
U-STOREY-GARAGE
U-STOREY-HR RES
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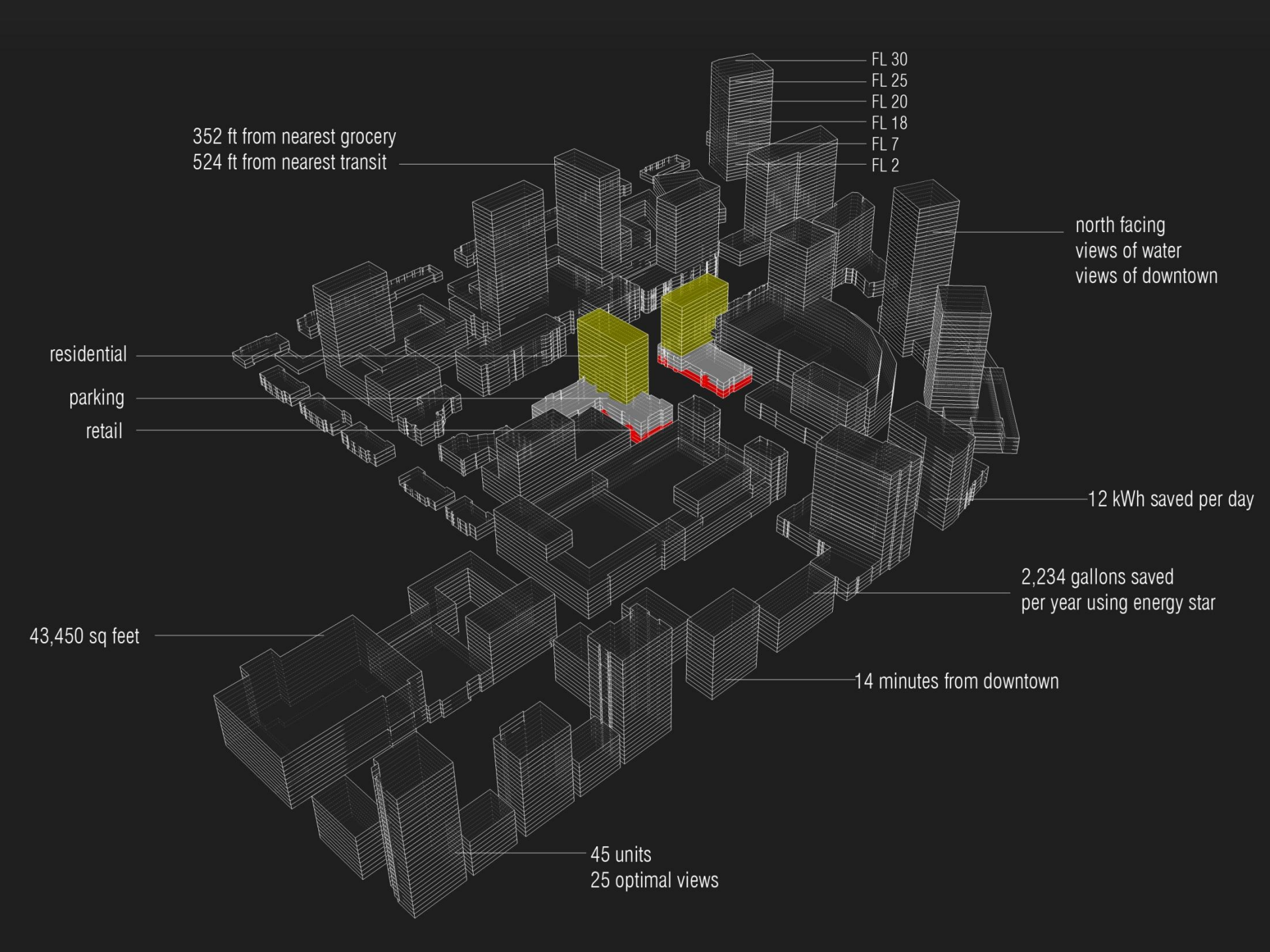
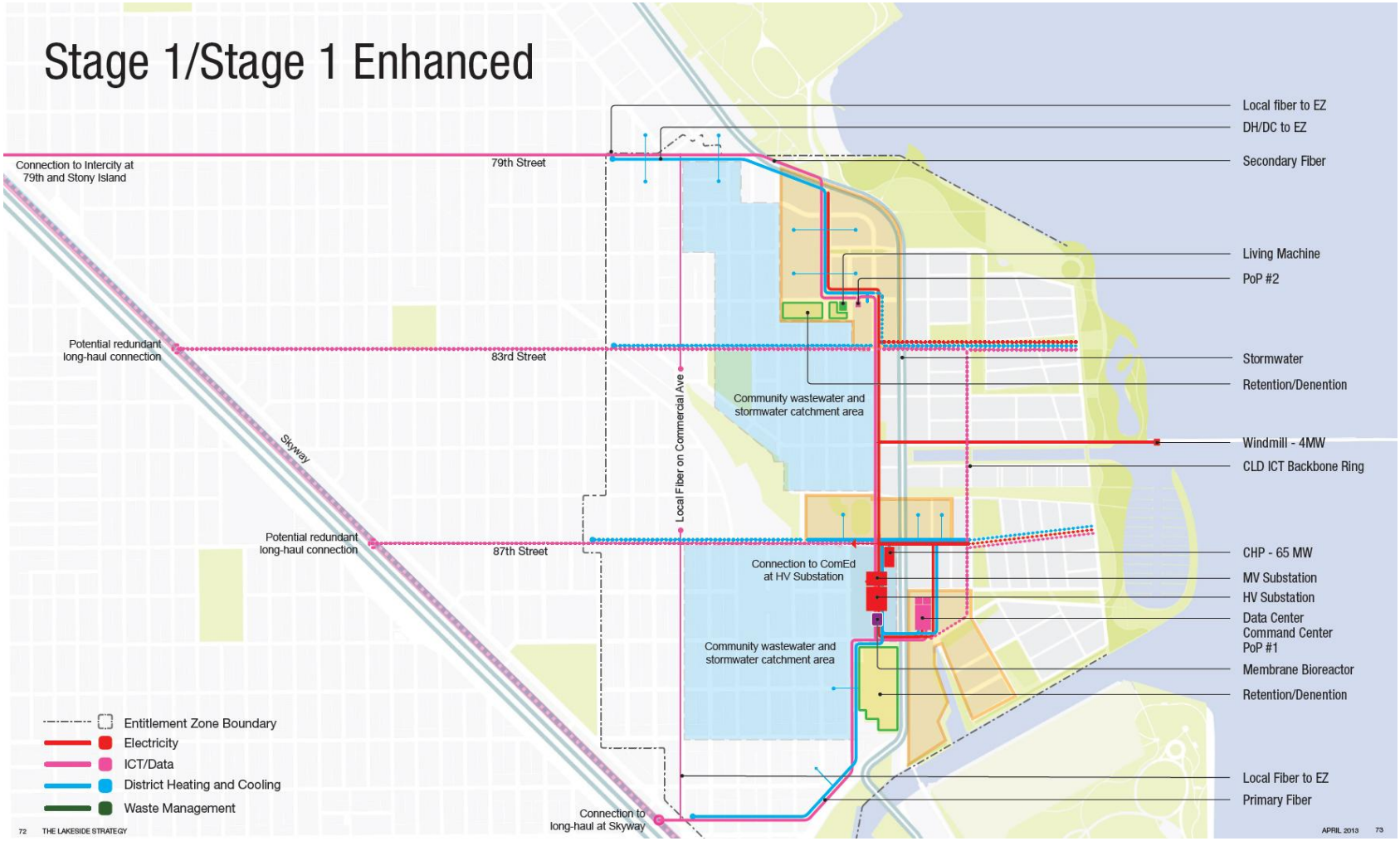
US11.0
US12.0
US13.0
US14.0
Autodesk 3ds Max 2012 laskeside.max
Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering Customize MAXScript Help
Graphite Modeling Tools
Freeform
Selection
Object Paint
Polygon Modeling
[+] [Perspective] [Wireframe]
Utilities
More...
Sets
Asset Browser
Camera Match
Collapse
Color Clipboard
Measure
Motion Capture
Reset XForm
MAXScript
Flight Studio (c)
DB Connection
connect to postgis db, all functionality dependent on succesful connection
Database Connection
DB name
somum
DB address
172.16.2.165
DB username
postgres
DB password
Connect
Connection Status:
disconnected
Active Model
sets the active model for use by other functions
load model
Load Model
create new
Add Model
Load Features
load feature geometry and data from the active model
From Model
Select
Load
From SQL
Select
Load
By Feature Type
Storeys
Blocks
Buildings
Districts
Parcels
Regions
Select
Load
Feature Attributes
define geometry as features and access feature attribute editing
Attributes for:
0 features selected
feature type:
prototype:
Define
Recalculate Attributes
Attribute Editor
Commit Features
features which have been edited, can/will be added to this repository, committing changes will alter the DB
Staged to Commit
stage
unstage
Commit Changes
Thematic Analysis
Select Object(s) to Locate Parameter(s) for Thematic Analysis
Select Parameter to Bind
Parameters Are Here
Select Thematic Mode
As Range
As Type
from
to
0 / 100
None Selected
Click or click-and-drag to select objects
Add Time Tag
Auto Key
Selected
Set Key
Key Filters...
3:21 PM
11/29/2012

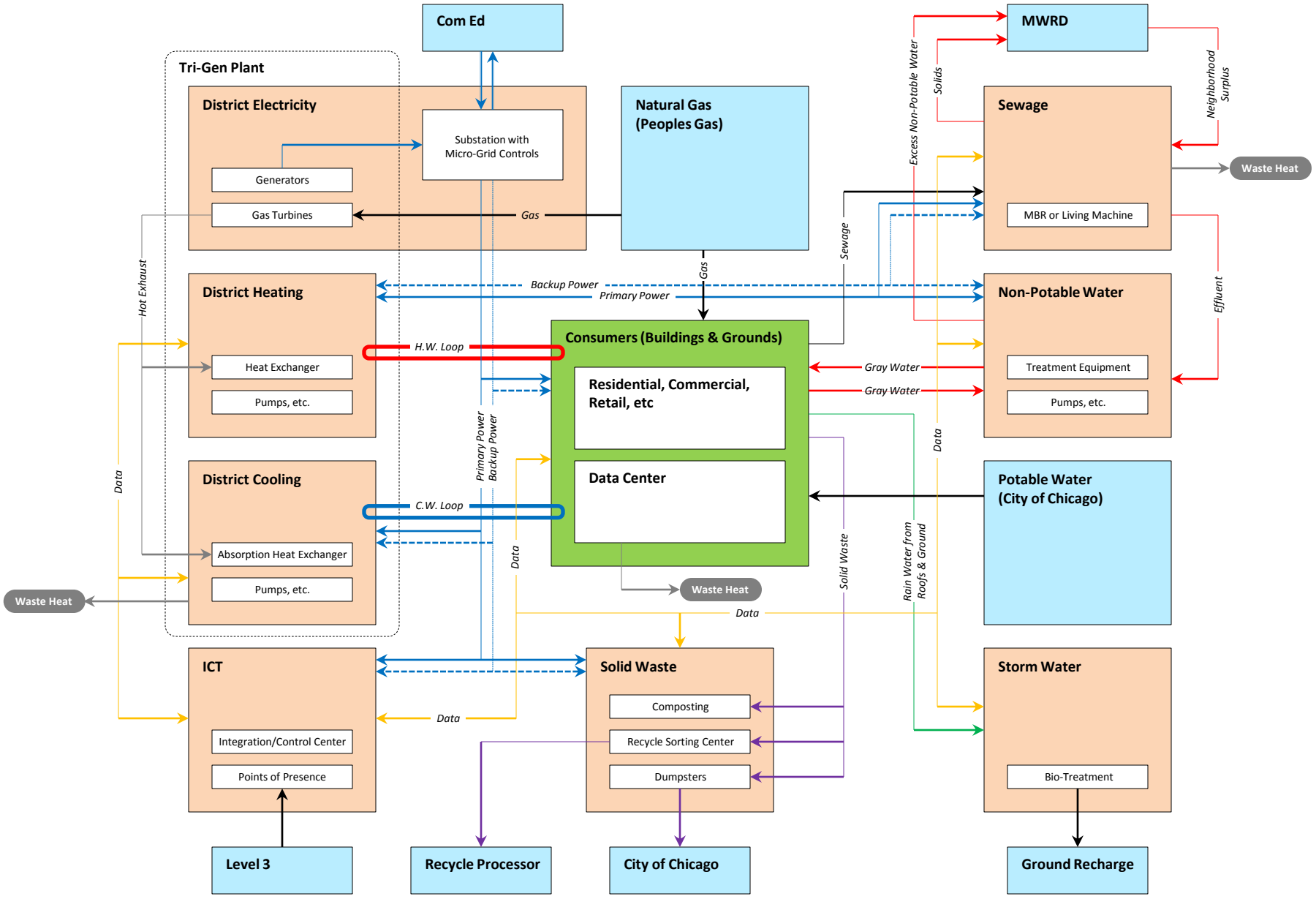

FL 30
FL 25
FL 20
FL 18
FL 7
FL 2
352 ft from nearest grocery
524 ft from nearest transit
north facing
views of water
views of downtown
residential
parking
retail
12 kWh saved per day
2,234 gallons saved
per year using energy star
43,450 sq feet
14 minutes from downtown
45 units
25 optimal views

Urban Infrastructure Integration

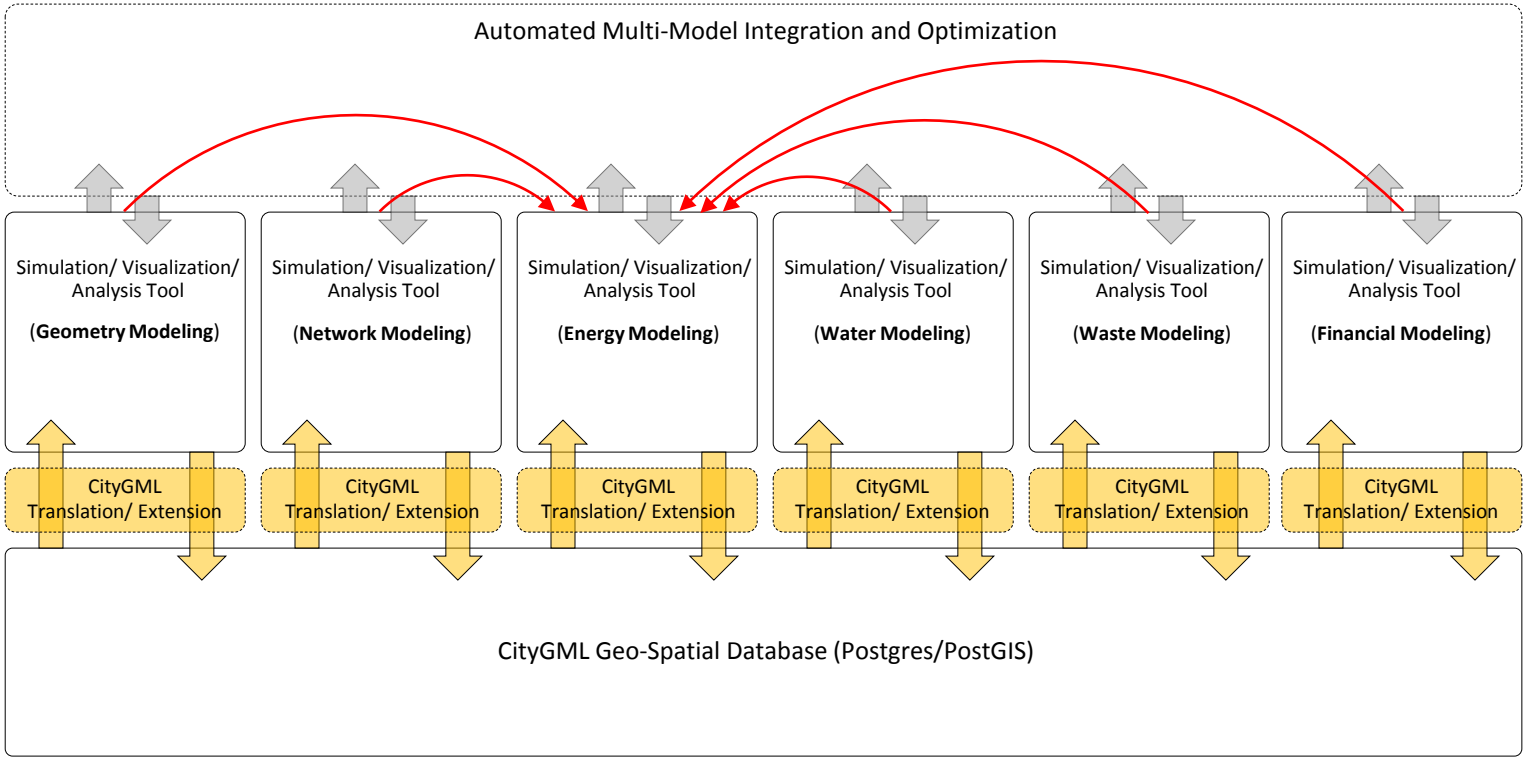
Stage 1/Stage 1 Enhanced



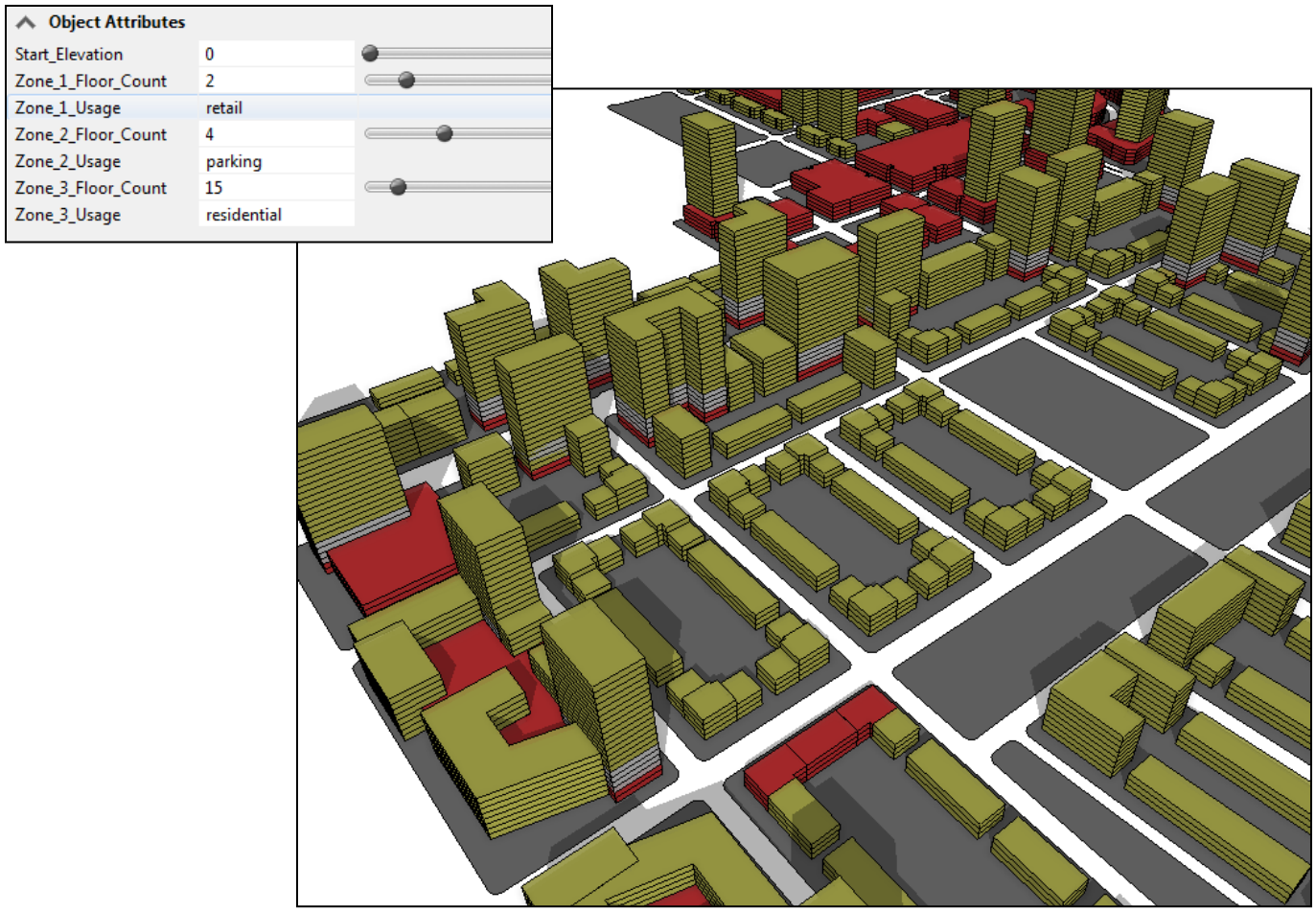
Lakeside Utilities Infrastructure Schematic



LakeSIM Framework



Commercial Responses: CityEngine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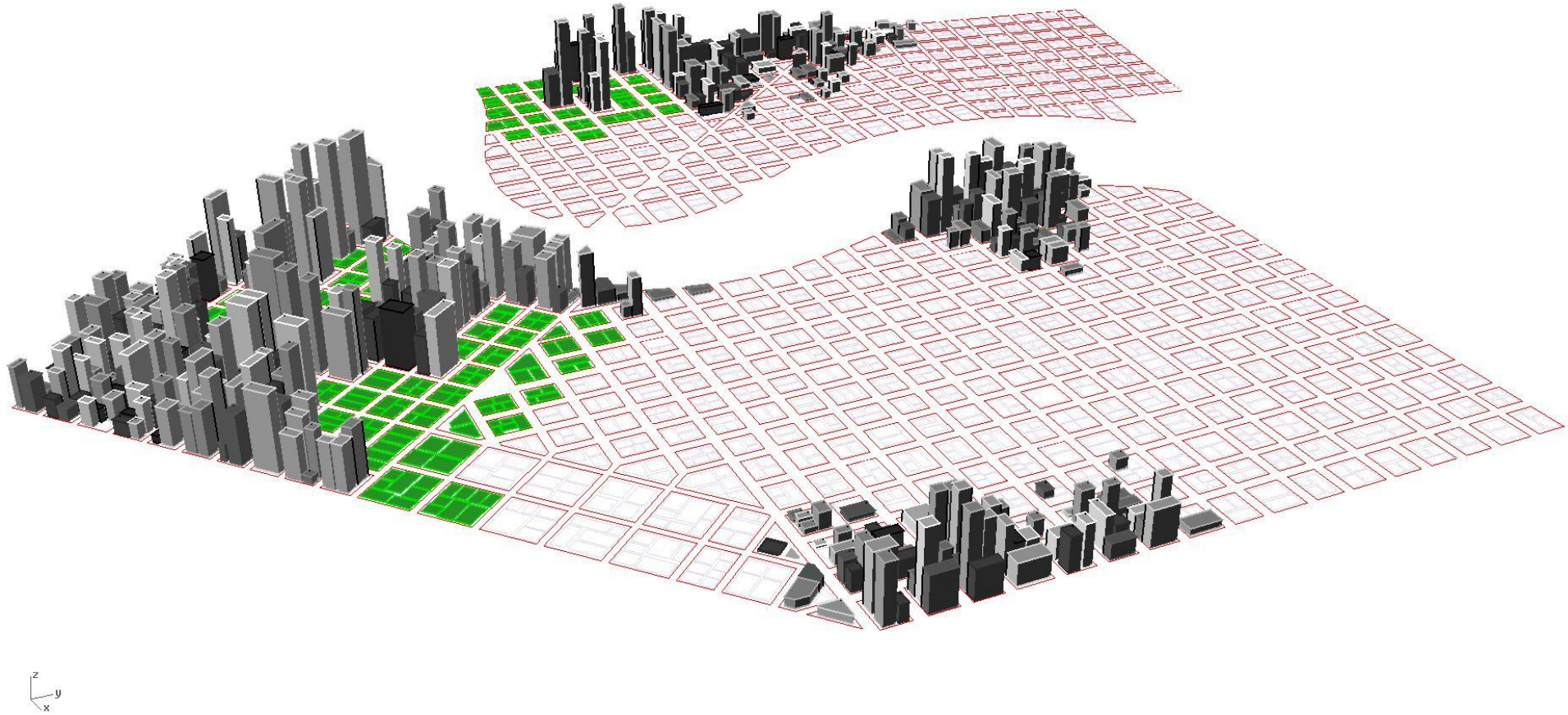
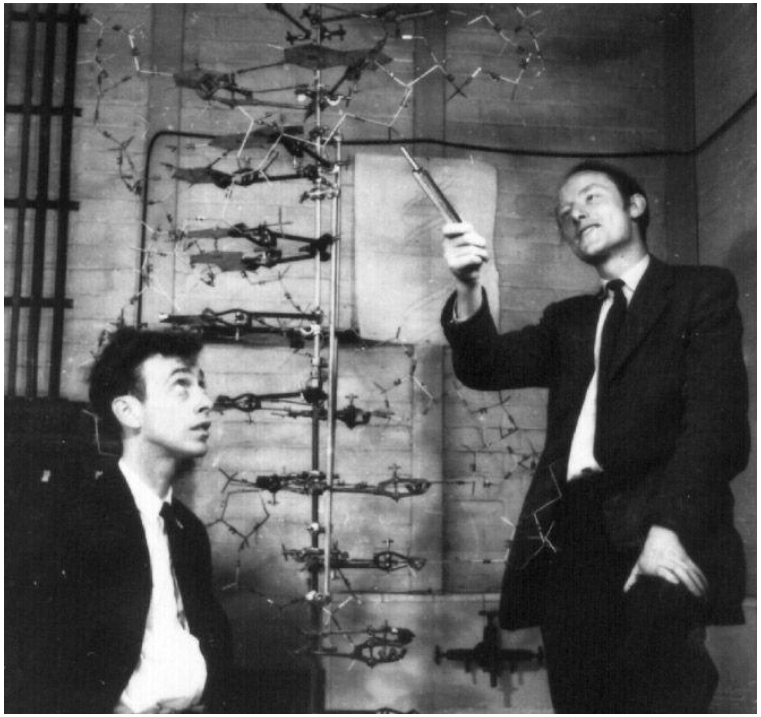
2
Zone_1_Usage
retail
Zone_2_Floor_Count
4
Zone_2_Usage
parking
Zone_3_Floor_Count
15
Zone_3_Usage
residential

Generative Design: Happy City

City Happiness | 47014:-)



Information City



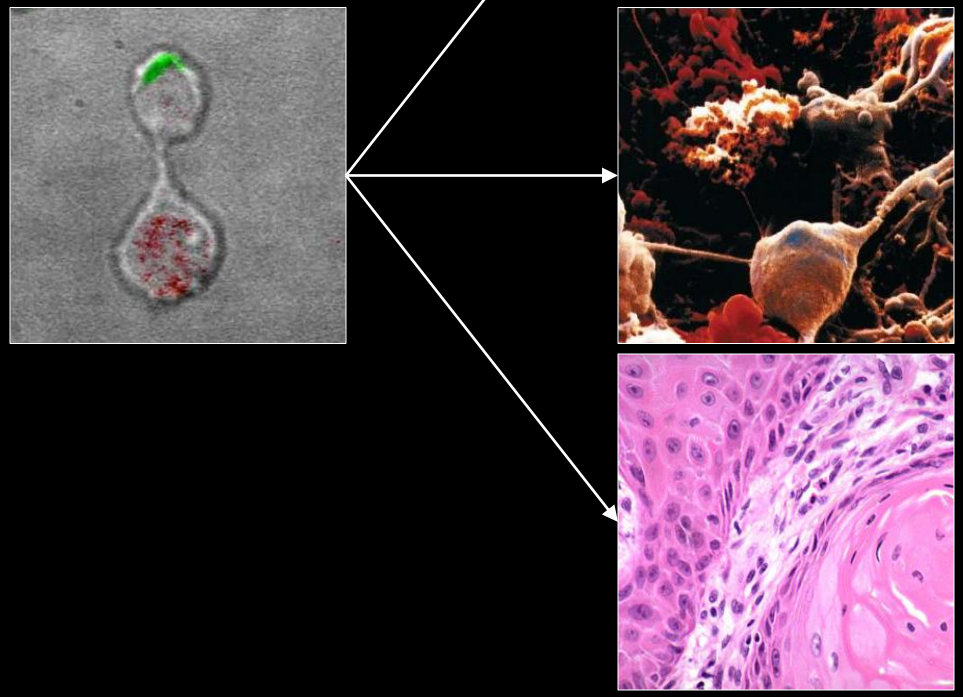
The Double-Helix Base-Pairs Structure of DNA, 1953, James D. Watson and Francis Crick

Genes to messenger to proteins

DNA → mRNA → Protein

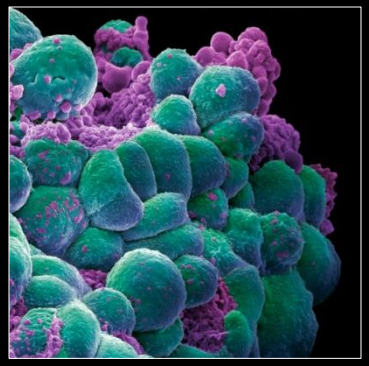
Biological information flow

The Central Dogma, 1958, Francis Crick

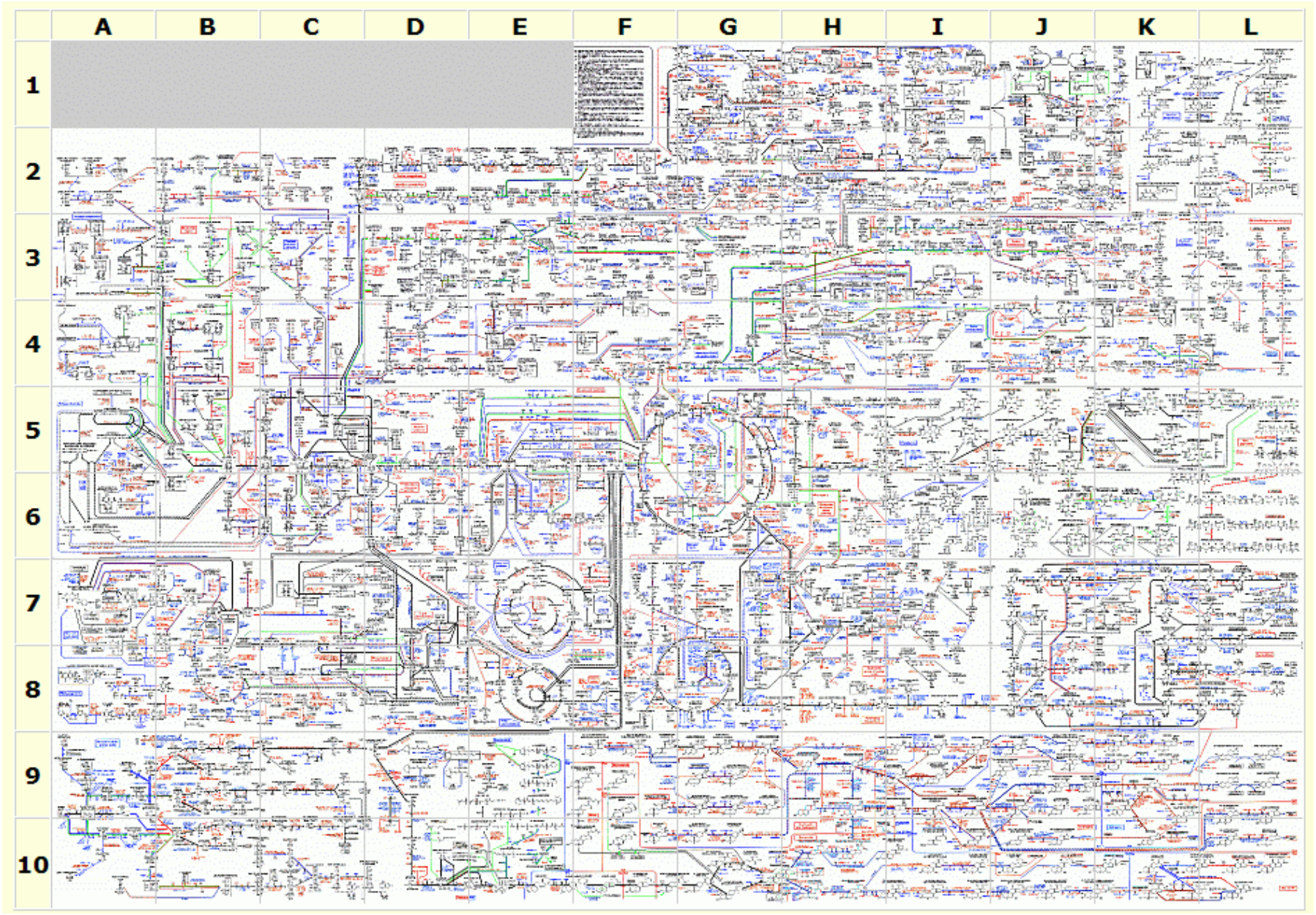


Metabolism

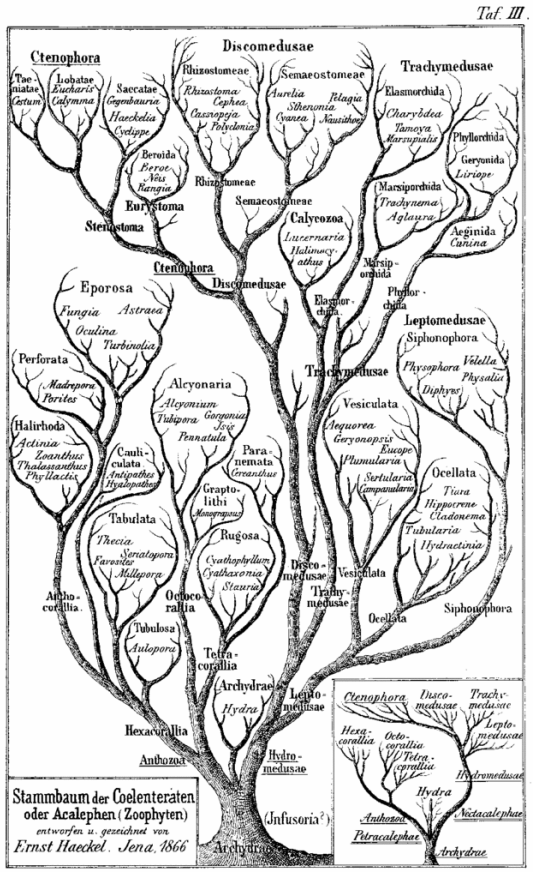
Neural Activity

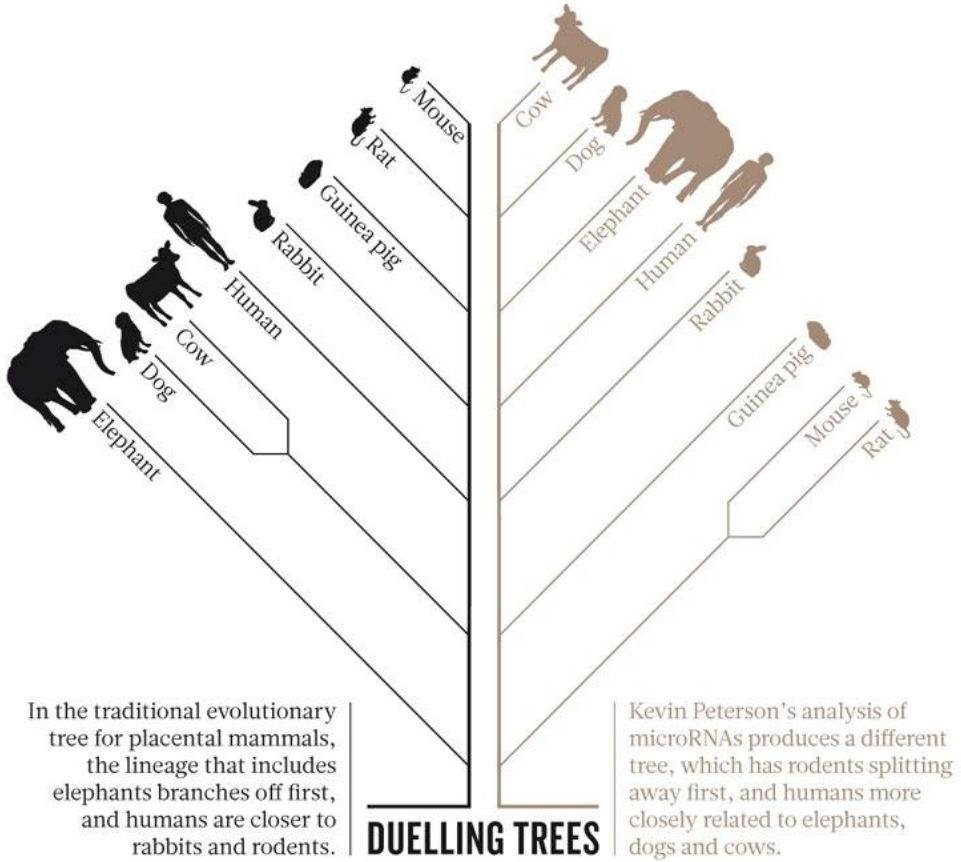


Cancer



Metabolic Pathway Network





Classification Systems

DNA Research Points to New Insight Into Cancers

By GINA KOLATA
Published: May 1, 2013 | 7 Comments

To the surprise of scientists, the most dangerous cancers of the uterine lining closely resemble the worst ovarian and breast cancers, raising the tantalizing possibility that the three deadly cancers might respond to the same drugs.

Readers' Comments
Share your thoughts.
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This finding, part of a major new study, is the best evidence yet that cancer will increasingly be seen as a disease defined by its genetic fingerprint rather than by the organ where it originated, researchers say.

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SAVE
E-MAIL
SHARE
PRINT
REPRINTS

The study of endometrial cancer — a cancer of the uterine lining — and another of acute myeloid leukemia, published simultaneously on Wednesday by Nature and the New England Journal of Medicine, are part of a sprawling, ambitious project by the National Institutes of Health to scrutinize DNA aberrations in common cancers. The endometrial cancer and leukemia efforts alone involved more than 100 researchers who studied close to 400 endometrial tumors and 200 leukemias.

"This is exploring the landscape of cancer genomics," said Dr. David P. Steensma, a leukemia researcher at the Dana-Farber Cancer Institute who was not involved with the studies. "Many developments in medicine are about treatments or tests that are only useful for a certain period of time until something better comes by. But this is something that will be useful 200 years from now. This is a landmark that will stand the test of time."

Endometrial cancer is the most common gynecological cancer in American women and strikes nearly 50,000 of them a year, killing about 8,000. Acute myeloid leukemia, the most prevalent adult leukemia, is diagnosed in about 14,000 Americans a year and kills about 10,000.

The acute myeloid leukemia study identified virtually all of the common genetic malfunctions that occur in it, providing a new foundation for assessing which cancers will be lethal unless the patient gets a risky bone marrow transplant and which can be treated with chemotherapy alone.

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Debating Age Limits on Tobacco
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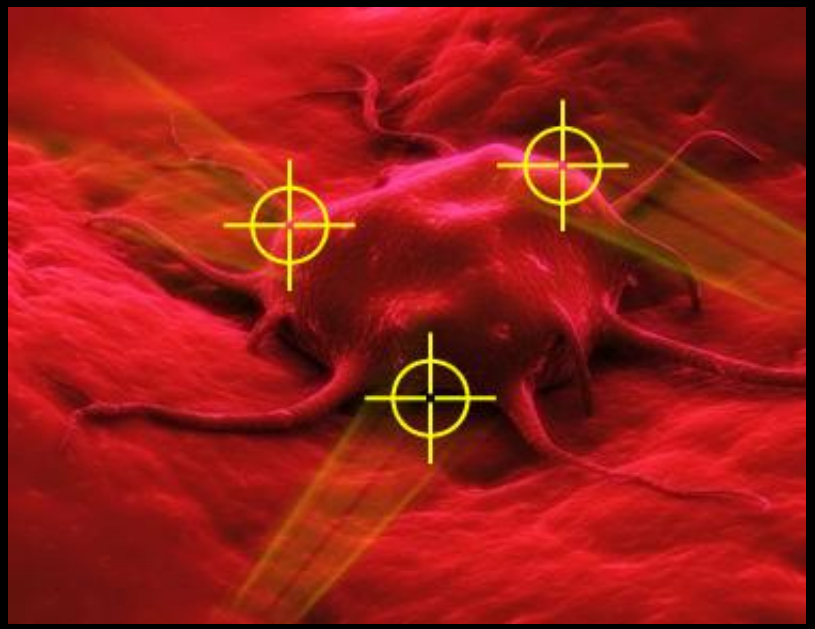
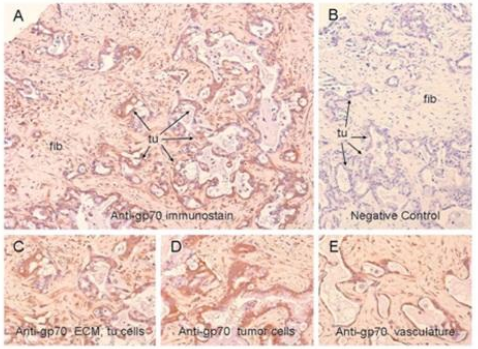


Clinical Validation of Predictable Mechanisms-of-Action

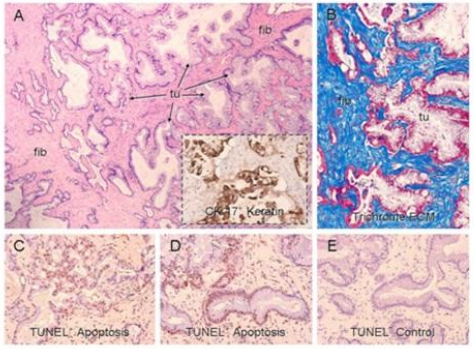
Ability of Rexin-G to Seek-out, Focus its Efficacy, and Eradicate Metastasis

Biodistribution of Rexin-G to a Liver Lesion in Stage IV Metastatic Pancreatic Cancer

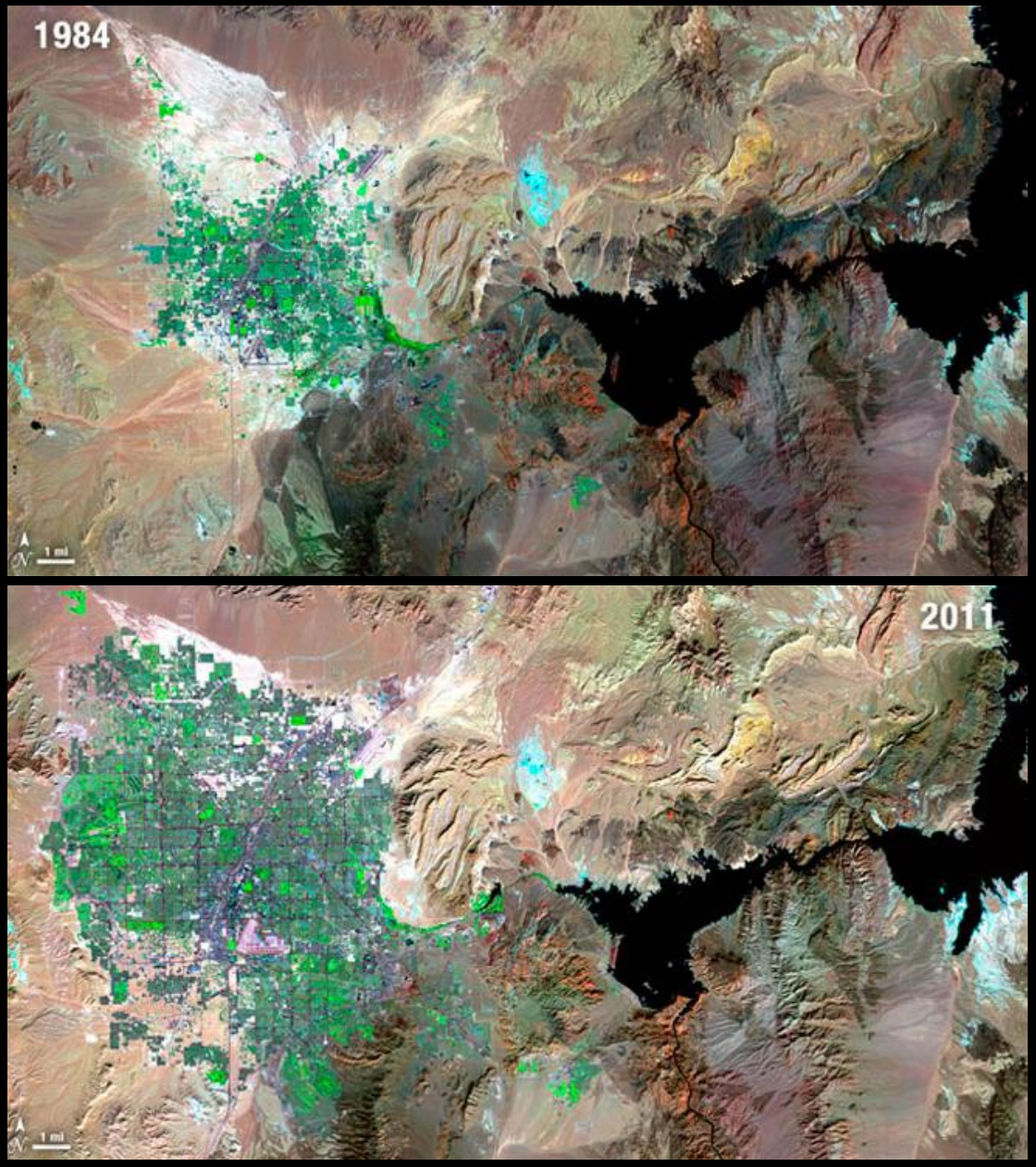


Pathotropic tumor-targeting platform directs the nanoparticles to the lesion, while the retrovector envelope focuses the delivery to the target cells.

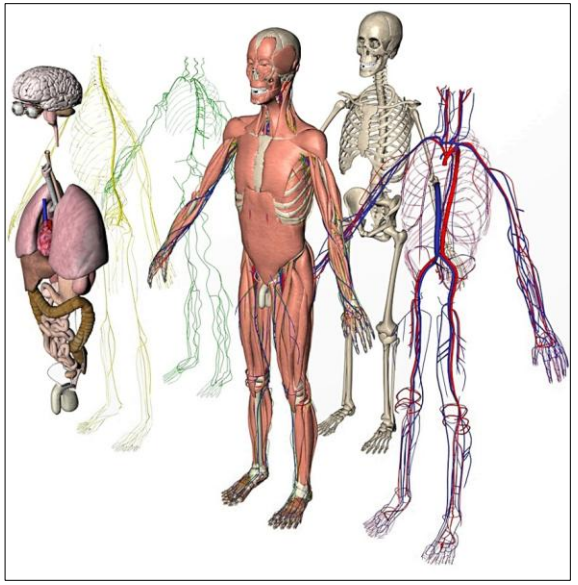
Tumor-Destruction Mechanisms by Rexin-G is Shown to be Consistent from Mice to Man



Far from a flagrant proliferative tumor, this surgical biopsy shows degeneration, fibrosis, and the massive death of tumor cells by apoptosis, post-treatment.


1984
1 mi
2011
1 mi

FIVE POINTS ACADEMY
ONLY



Could an Information-Centric Theory of Cities lead to revolutionary forms of urban design and policy-making, just as an Information-Centric Theory of Biology has done for medicine?

What are the URBAN equivalents of:

DNA, Genes, Cells, etc.

The Metabolic Pathway

The Tree of Life (speciation)

Genetic Engineering & Targeted Therapies

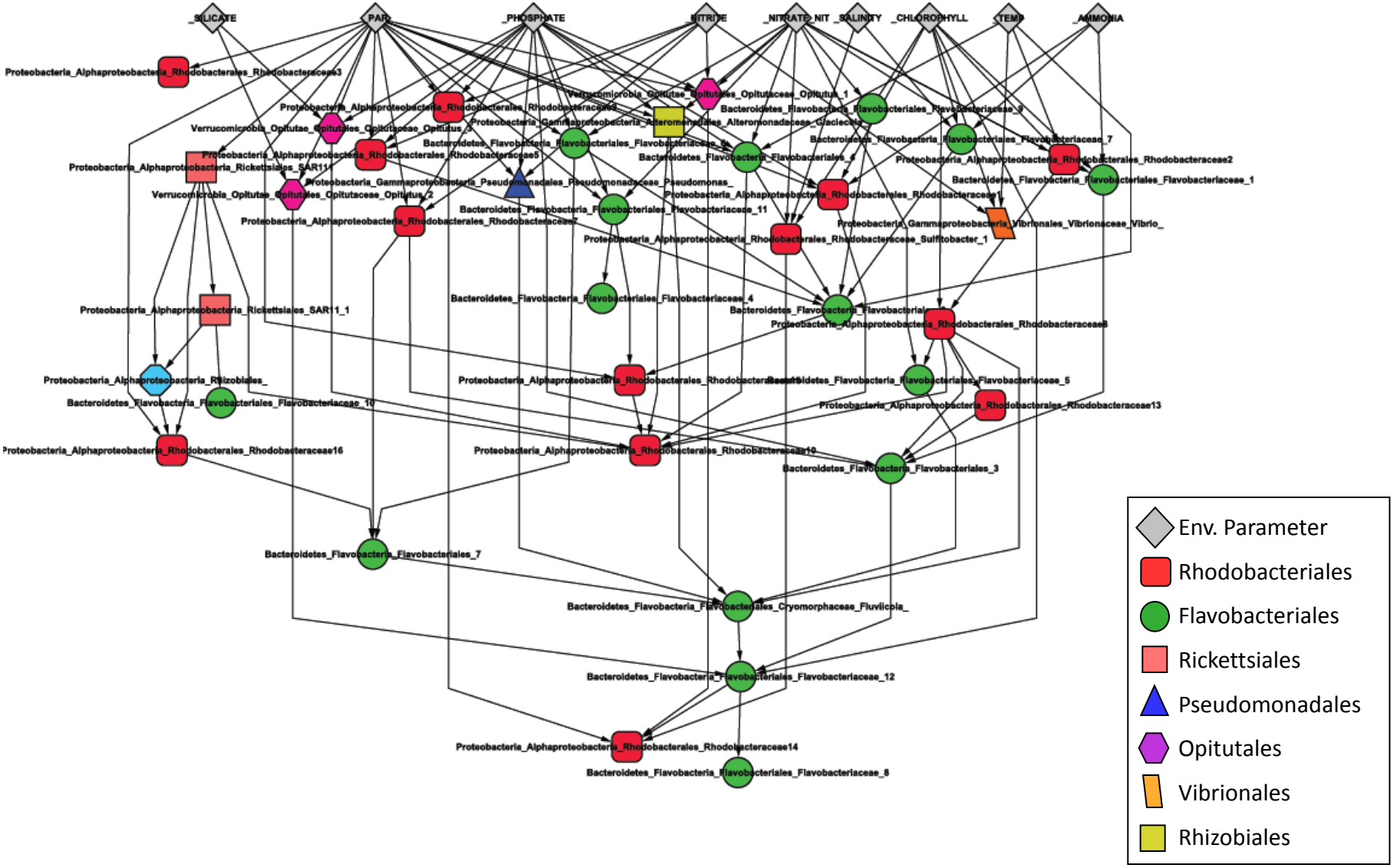
What are the BIOLOGICAL equivalents of:

People, Neighborhoods, Economic Systems, etc.

An “instant” city for a million people

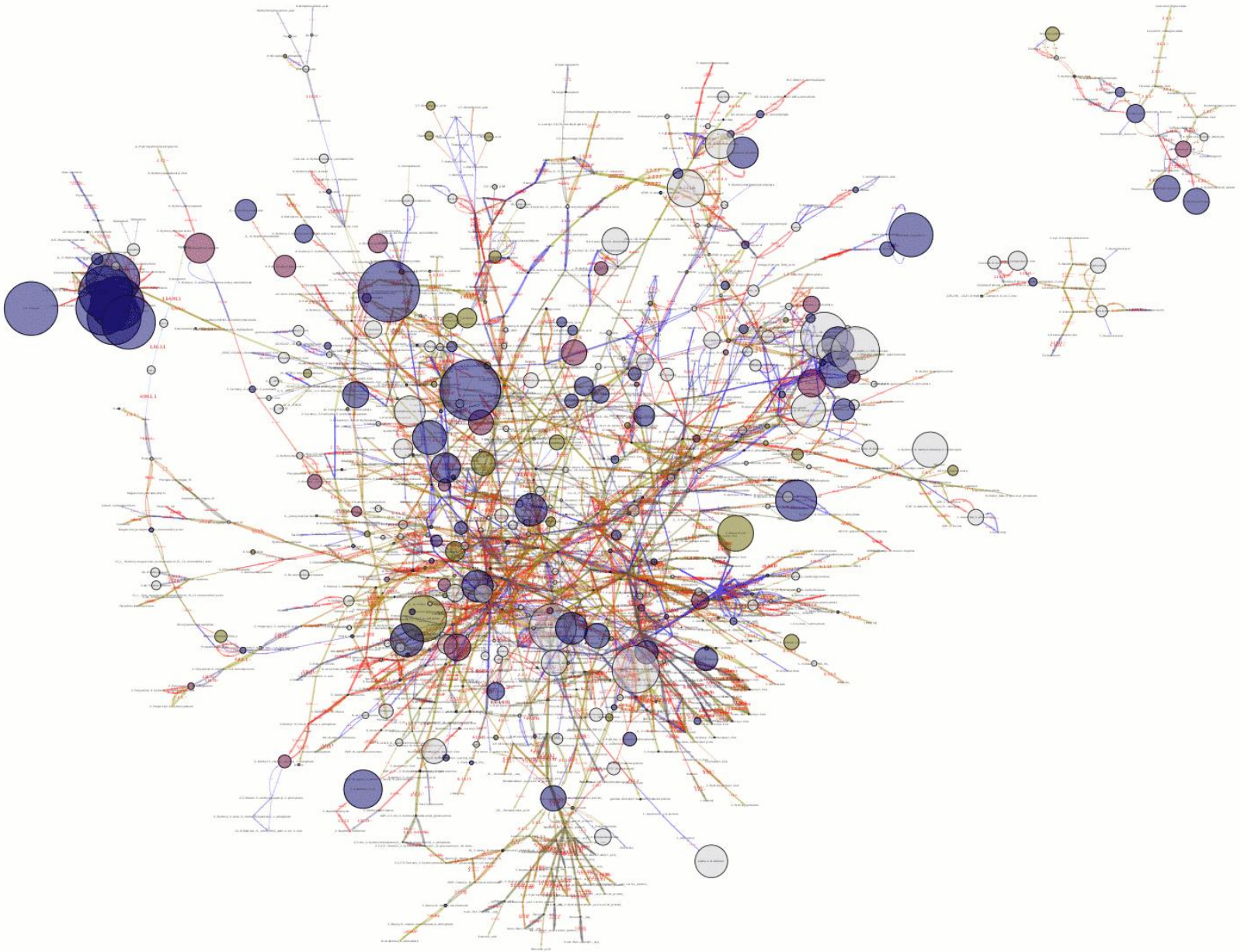
Urban Renewal

Direct Acyclical Graph – defined by Bayesian correlations between variables.



Larsen et al., Nature Methods, 2012

Associate PRMT-scores with environmental conditions



Urban Information Modeling

Towards an Information-Centric Theory of Cities and Urban Sustainability

Symposium on Sustainable Urban Design - Case Studies and Design Workflows
Massachusetts Institute of Technology May 6, 2013

SOM