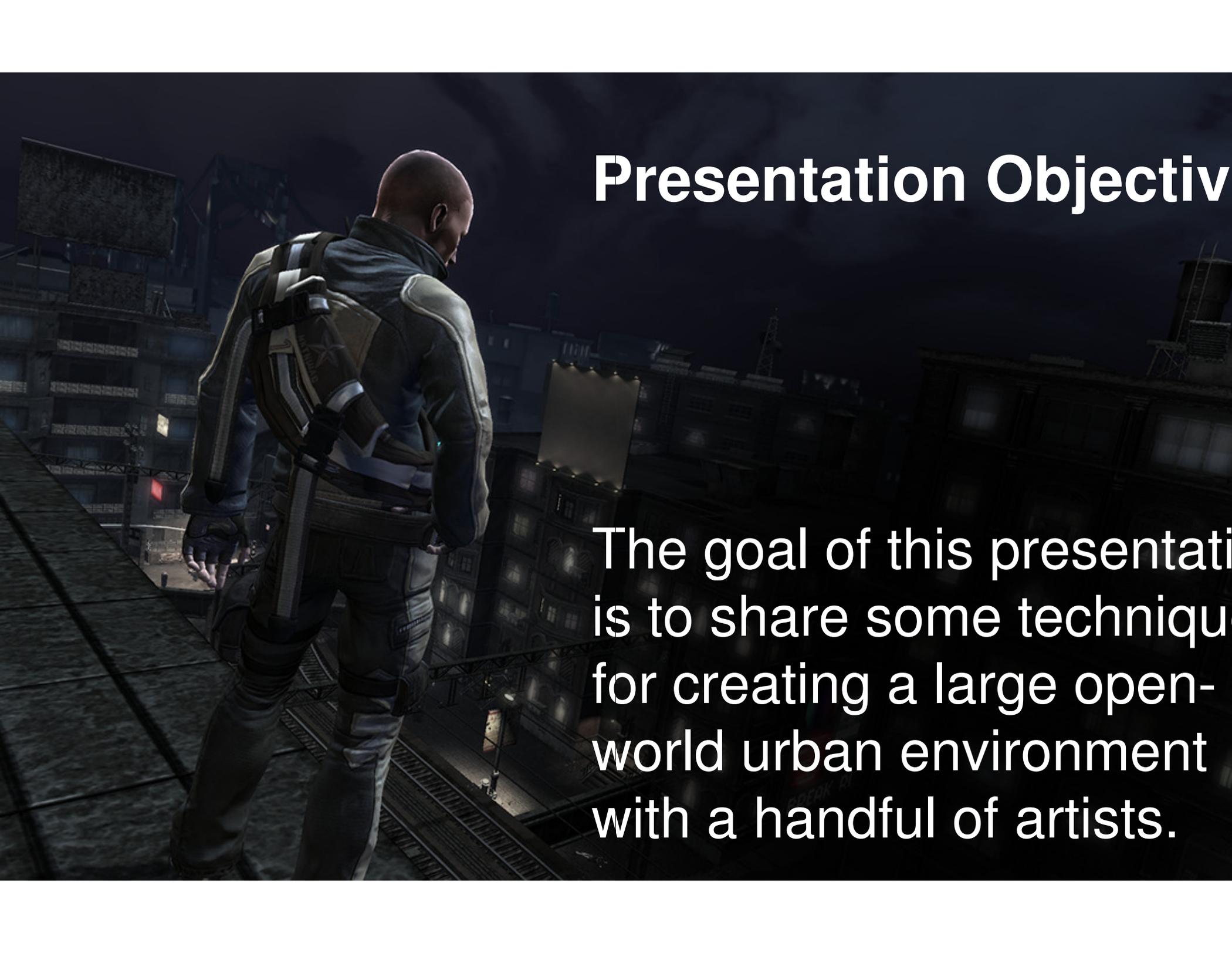


A character in a tactical suit with a backpack stands on a rooftop in a dark, industrial cityscape. The character is seen from the back, looking out over a city with various buildings and structures. The lighting is low, creating a moody atmosphere.

Building an open world game without an Army

GDC 2010

Nate Fox
Sucker Punch



Presentation Objectiv

The goal of this presentation is to share some techniques for creating a large open-world urban environment with a handful of artists.

famous' environment was created by a team of 12 artists





Top Level Outline

- Expectations in open world games
- Benefits of asset reuse
- Hex Tile System
- Standardized Building Footprints
- City Layout tricks
- Organic Spaces
- Streaming Issues
- The Cons
- Conclusion

Expectations in open world games

First, let's break down what Players expect from Open World environments before explaining Sucker Punch's system for meeting those expectations...

- Giant game world
- Interactivity
- Areas for Discovery
- Diverse Visuals



Expectations - Giant Game World



Players expect your world to feel huge... adventure all the way to the horizon!

Finding a way to make good on this expectation is an incredibly expensive proposition.

A huge, yet bland world, is a failure.

Failing to deliver on scale will give the impression that your game is anemic.

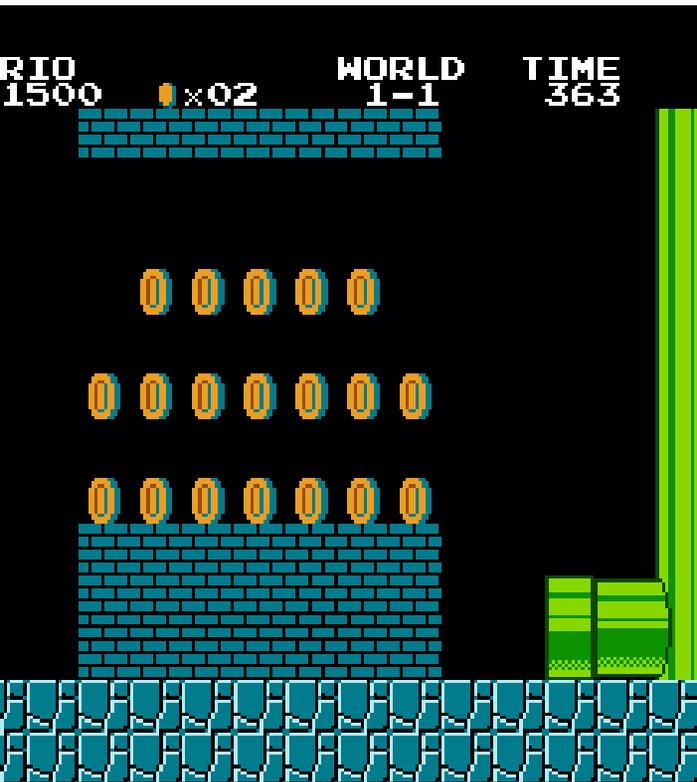
Expectations - Interactivity

Obviously, since it's a videogame, players expect an interactive landscape of opportunity.

Finding ways to make the world more than a static sculpture to walk through is also a complex design task and expensive art proposition. Plan ahead!



Expectations – Areas for Discovery



- While much of the game world is open at the start of the game, players expect to discover unique areas as they poke around.
- Fail to provide areas for discovery and your game isn't "deep".

Expectations – Diverse Visuals



- While real cities are generally fairly homogenous, open world games feature a great variety of different types of places to visit.
- A variety of neighborhoods is the traditional solution to this problem.
- Fail to offer diverse visuals and your game will feel repetitive.

Benefits of Asset Reuse

Why be a cheapskate and look for ways to reuse assets as much as possible? Let's break it down.

Cities are naturally
repetitious

Reuse allows you to focus
on what's important

Gameplay steals the
gamer's attention



Benefits of Reuse – Cities are naturally repetitious

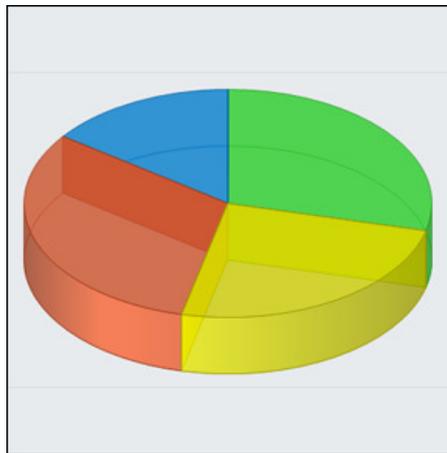


- How many different objects are there that can be found on a street?
- Seriously, once you have a couple of streetlights, dumpsters, bus stops, etc, you've got a city full of believable stuff.
- Buildings are the same way. How many skyscrapers do you need before you can't tell them apart?

Benefits of Reuse – Reuse allows you to focus on what's important.

If you made a pie chart for how to spend time working on the game environment, how would it look?

Would you rather work on rank and file buildings or Evil Villain lairs?



Both artists and players want the Evil Layers.





They're the areas of interest that players will remember.

Not every city block can be an Evil Lair...
remember, you need to deliver a huge world!



Benefits of Reuse – Gameplay steals the Player's attention



For most of the game the player is going to be focused on the interactive elements...



...A.K.A. the enemies shooting at him!



Focus your expressive art on where players are going to be spending their time... everywhere else, reuse



Hex Tile System

This is the system we used during the production of inFAMOUS to solve the aforementioned open-world creation issues.

The Basics

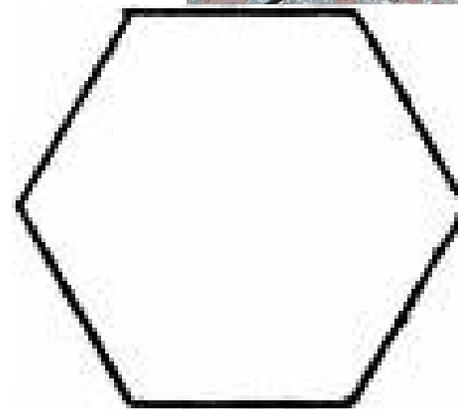
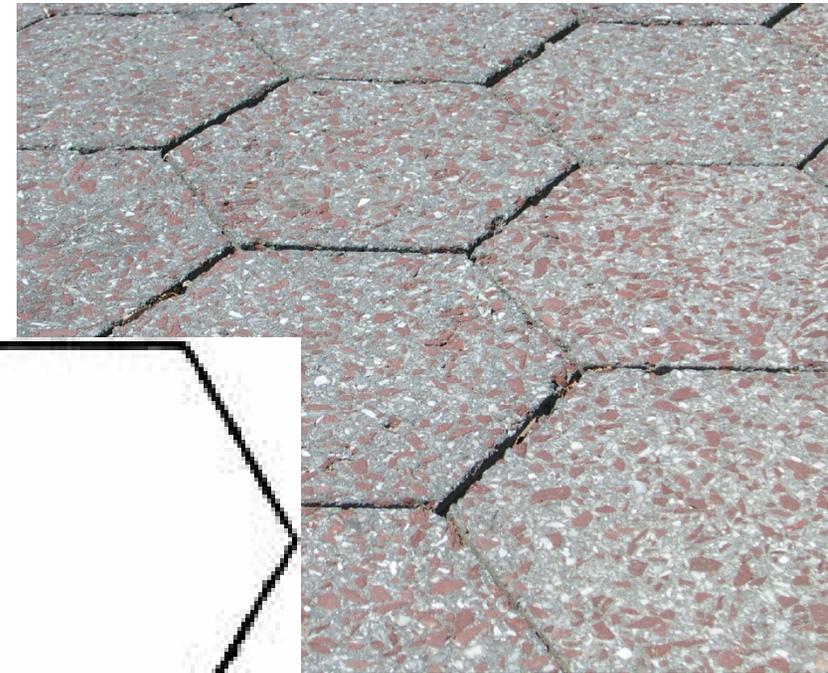
Intersection Simplification

Edge Conditions

Roads

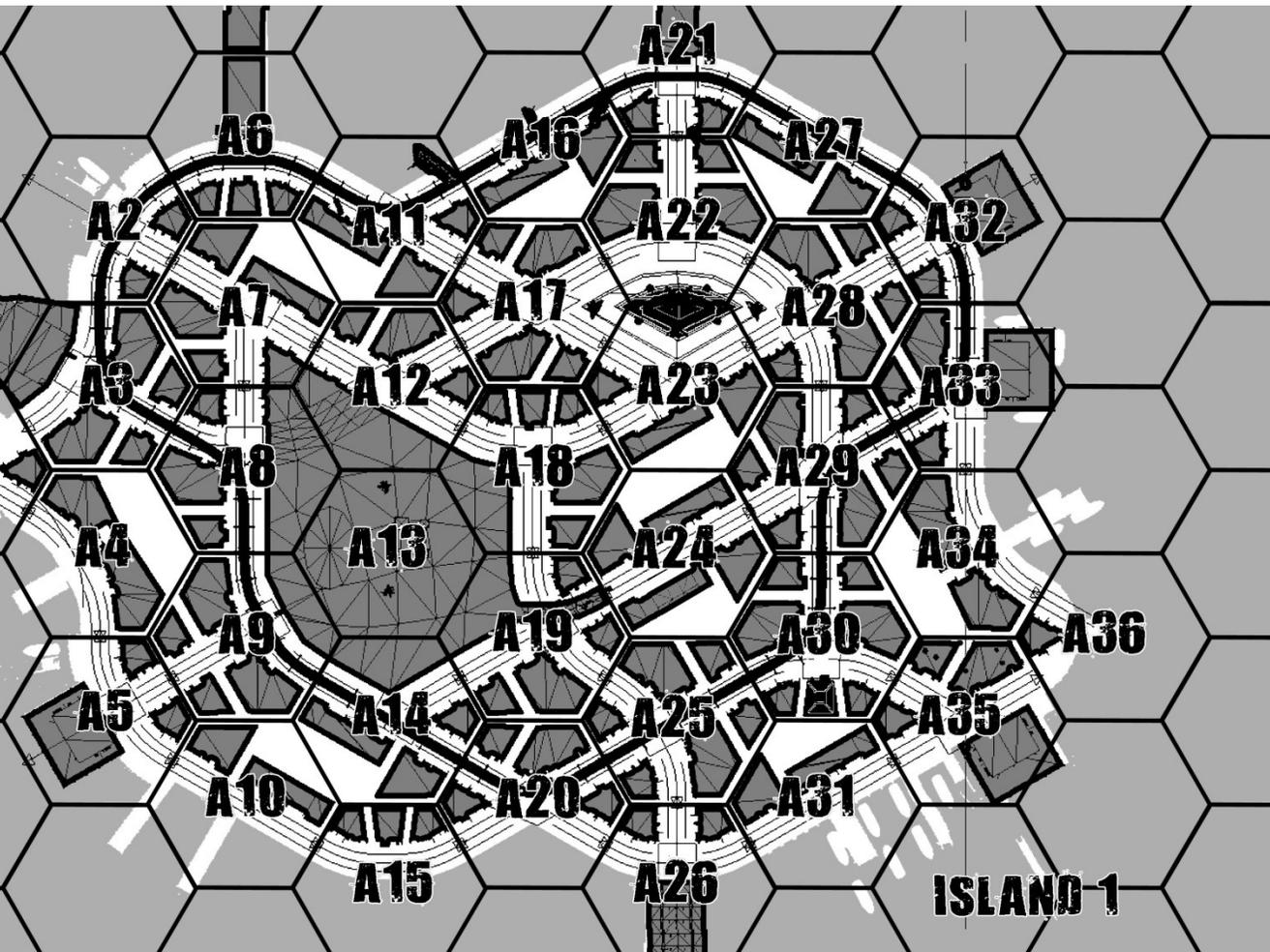
Elevation

Shoreline Hexes



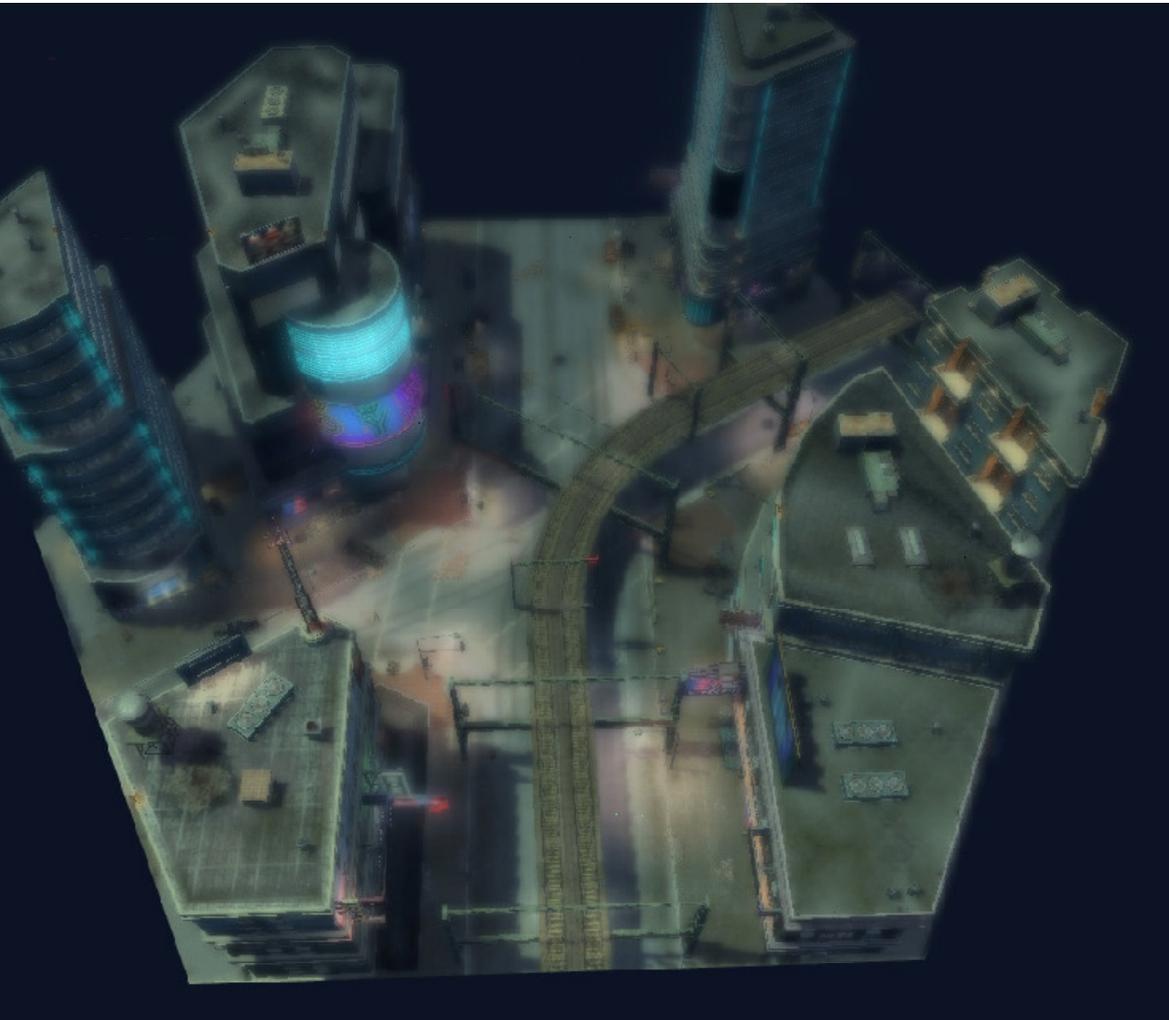
Hexagon

Hex Tile System – The Basics



- All of *inFamous* is created around tile hex pieces
- This is the map for the first island of the game

Hex Tile System – Intersection Simplification

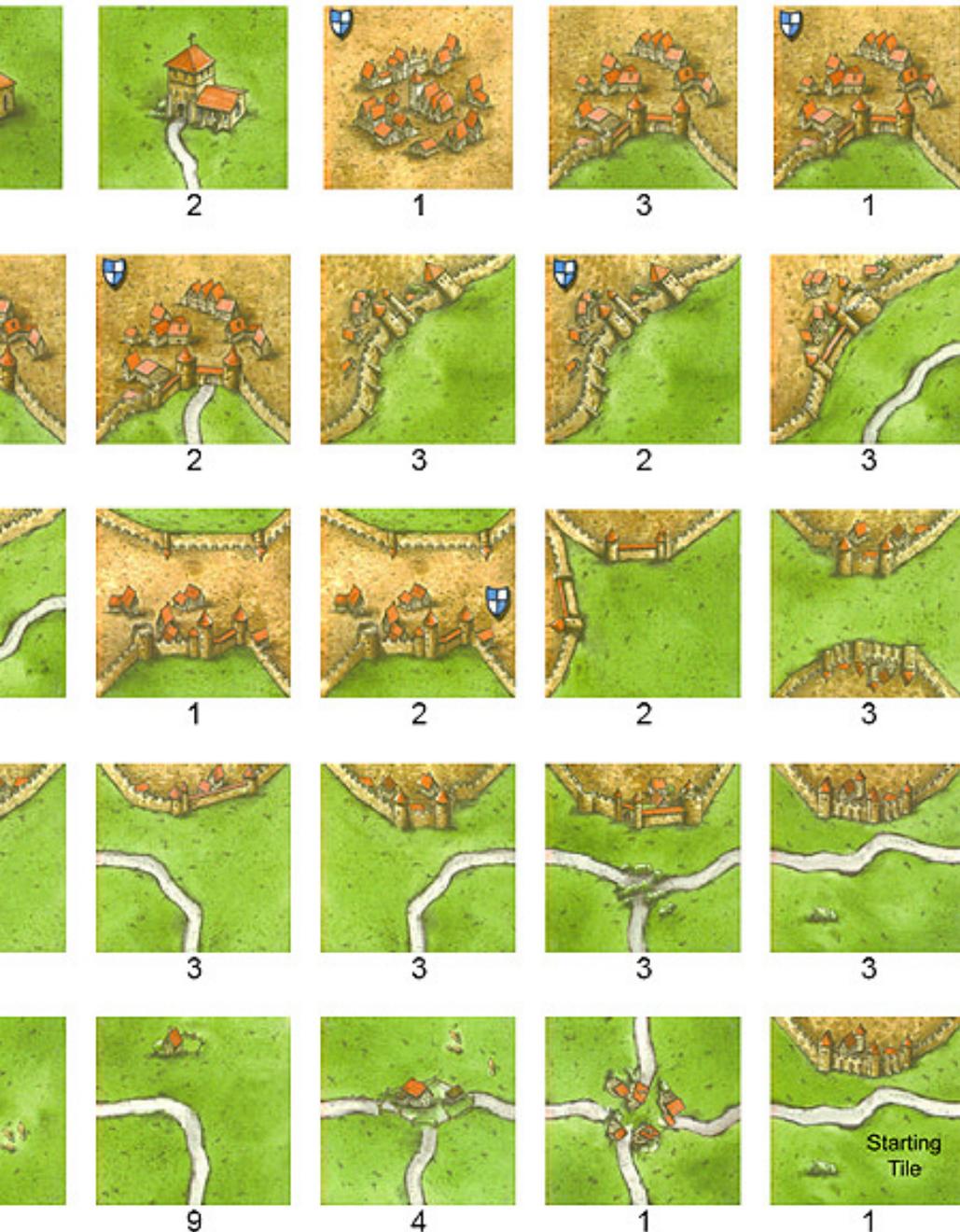


- Each of the hexes is built around an intersection.
- Intersections are harder to model than straight roads... so we made them easy to reuse.
- Intersections are often identical in real life cities (same angles, stop lights etc.). So consistency equals believability.

Hex Tile System – Edge Conditions



- Each hex has a small number of mirrored edge types so that each of the tiles can cleanly abut another tile.
- Given that the edges are identical, this hides the hex seam as everything lines up perfectly.



Hex Tile System – Edge Conditions

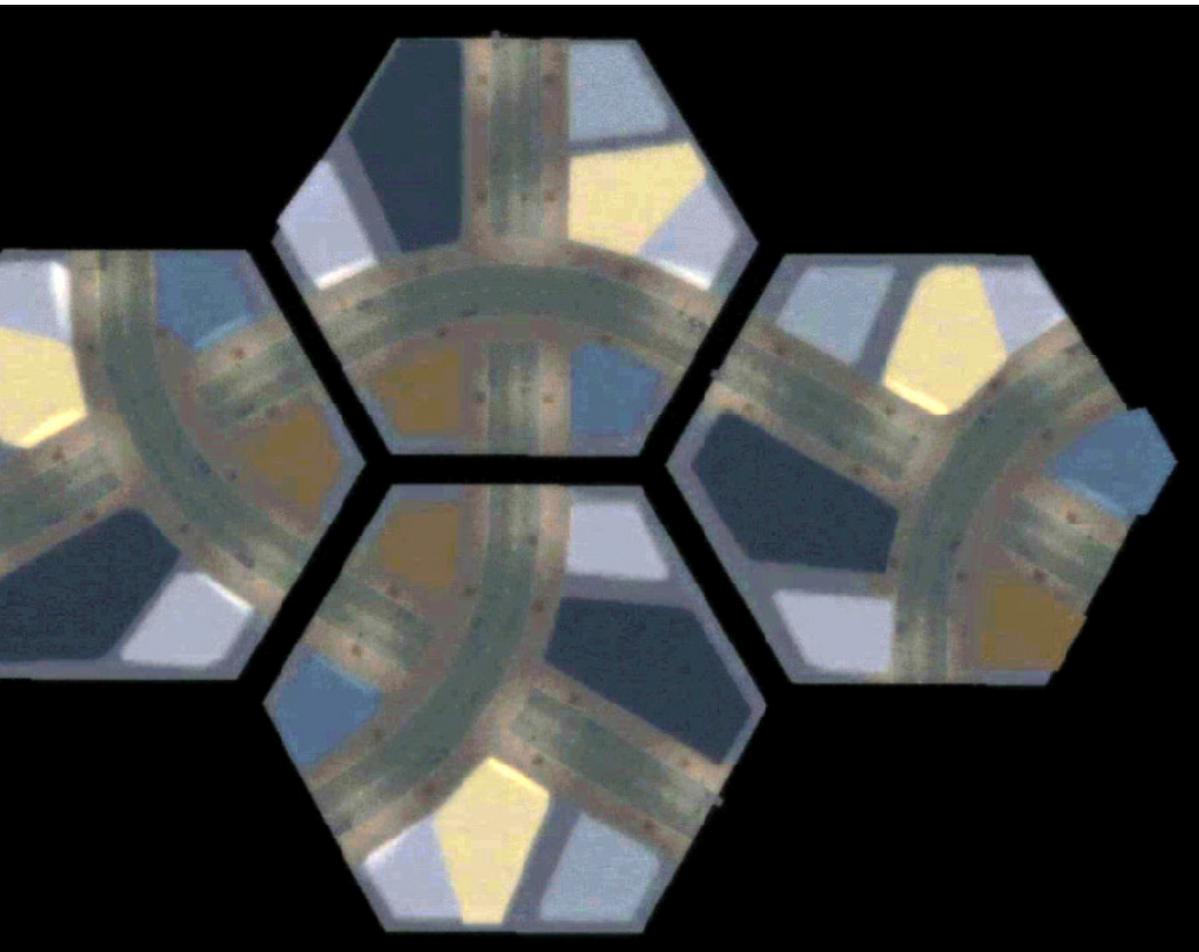
- The system is the same employed by many boardgames.
- Carcassonne tiles are the best example of the idea.
- By limiting the amount of edges types on your tiles you make it easy to fit them together in a variety of ways.

Hex Tile System – Edge Conditions



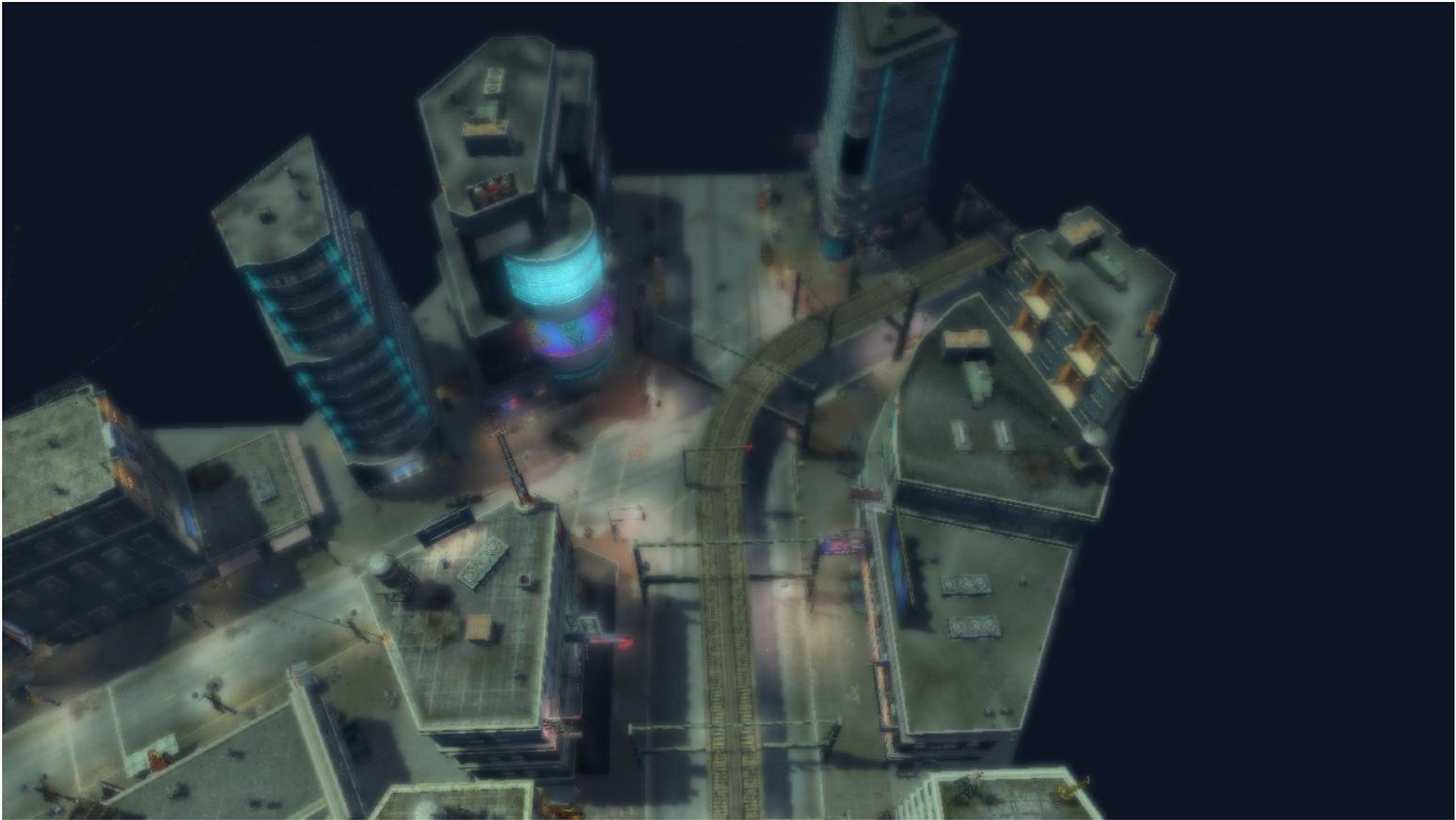
- Carcassonne demonstrates that organic designs can emerge from a limited palette of tile edge options.

Hex Tile System – Roads



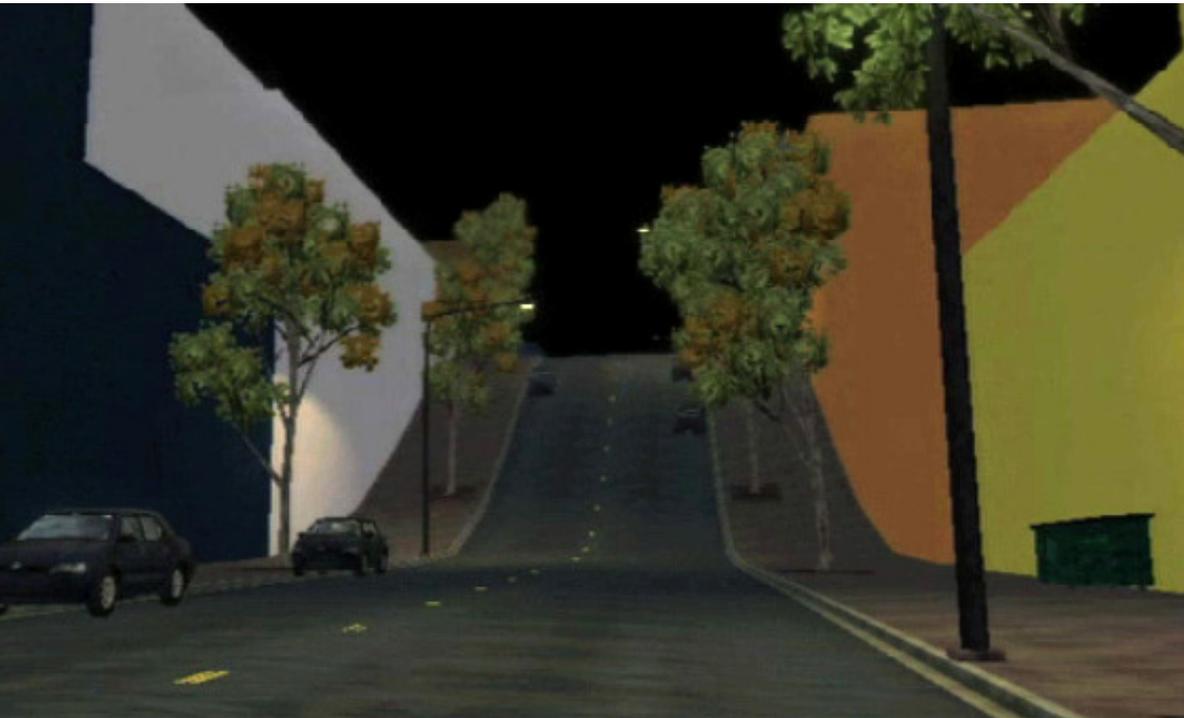
- Here are four versions of the same hex tile moved and rotated.
- The buildings are represented by colored boxes
- Even with just a single hex tile complex roadways can be created.

Hex Tile System – Roads



Of course the roads all line up perpendicular to the hex edge... this makes the seam nearly impossible to detect

Hex Tile System – Elevation



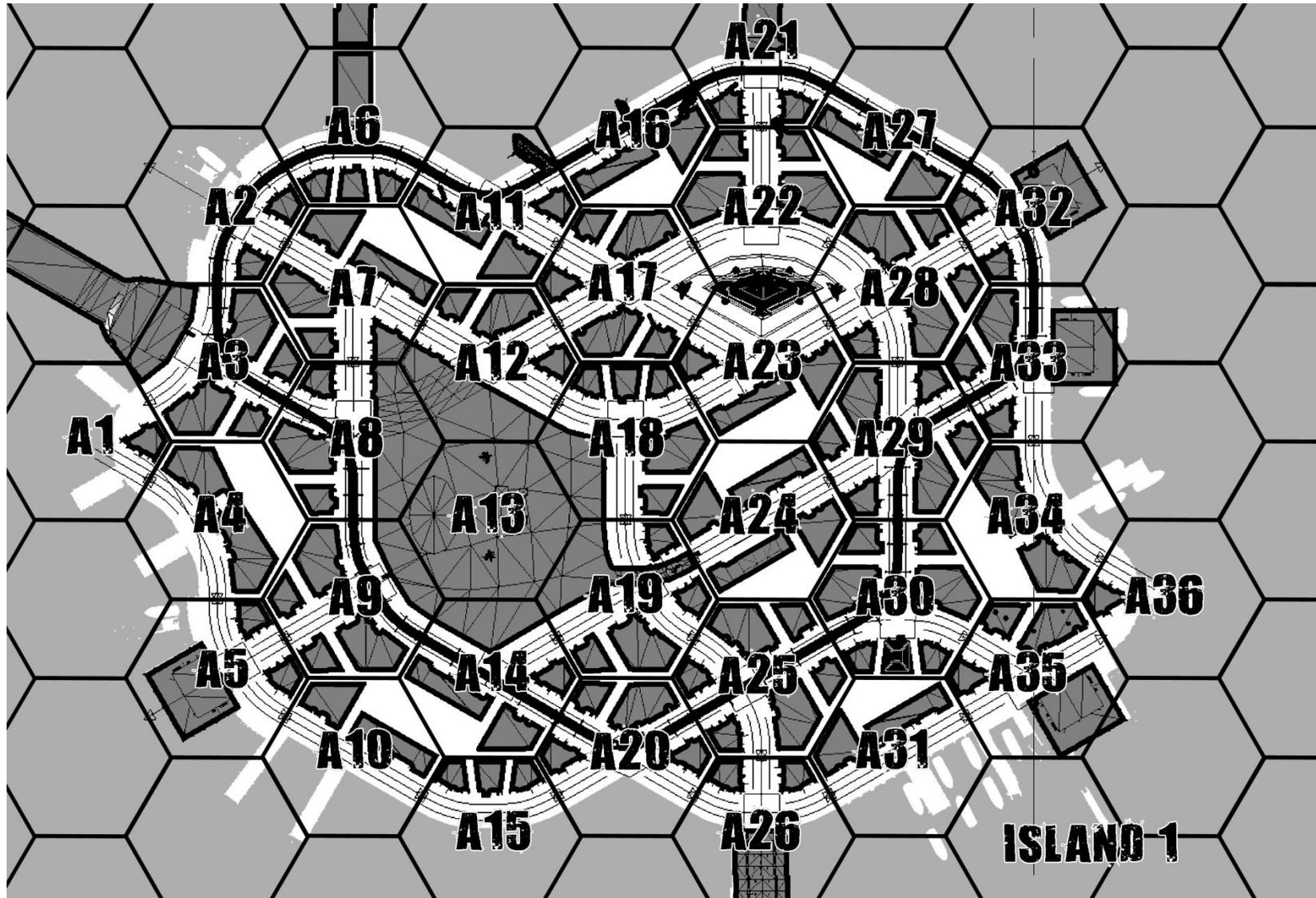
- Adding elevation is as easy as creating a new “hill” edge condition.
- So long as it lines up with other hills there is no problem.

Hex Tile System – Shoreline Hexes



- At some point your city will need a boundary, a place where it stops.
- We went with water.
- Shorelines are just another edge condition they line up next to each other just like everywhere else.

Hex Tile System

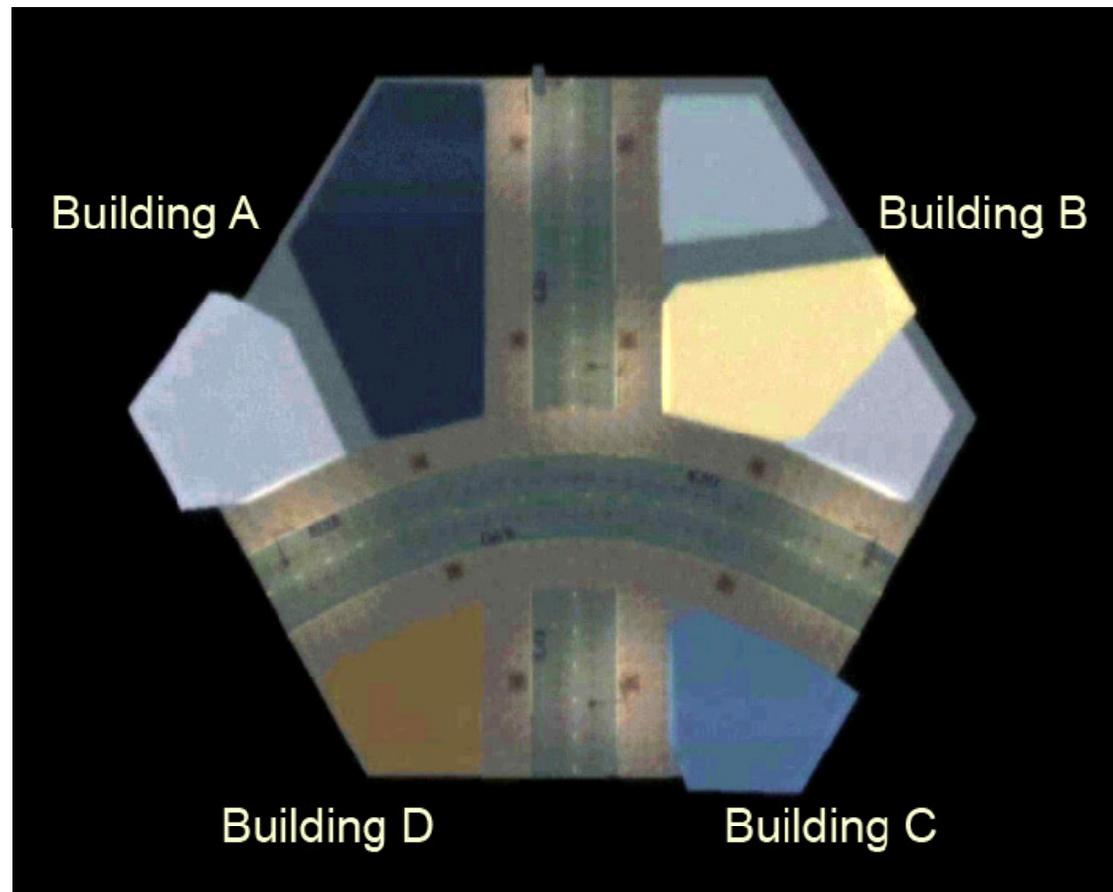


- Here's that map again... maybe now you can see how all the edges of the hex pieces line up for easy reuse?

Building Footprints

The buildings in our game all fit into predetermined slots (or “footprints”) on each Hex Tile.

- Functional Stand-ins
- Footprint Swap-Outs
- Building Variety
- HSV Shifting

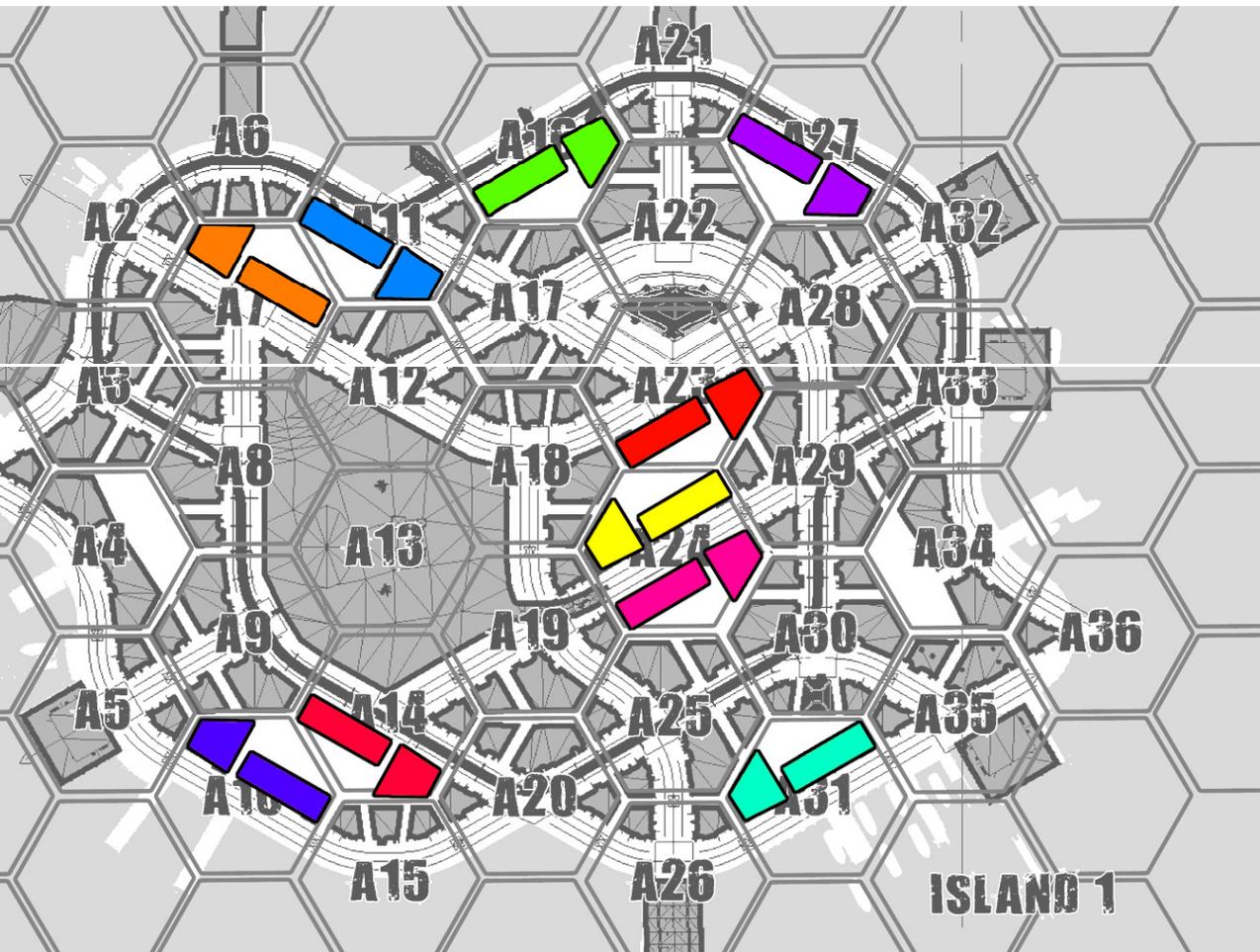


Building Footprints



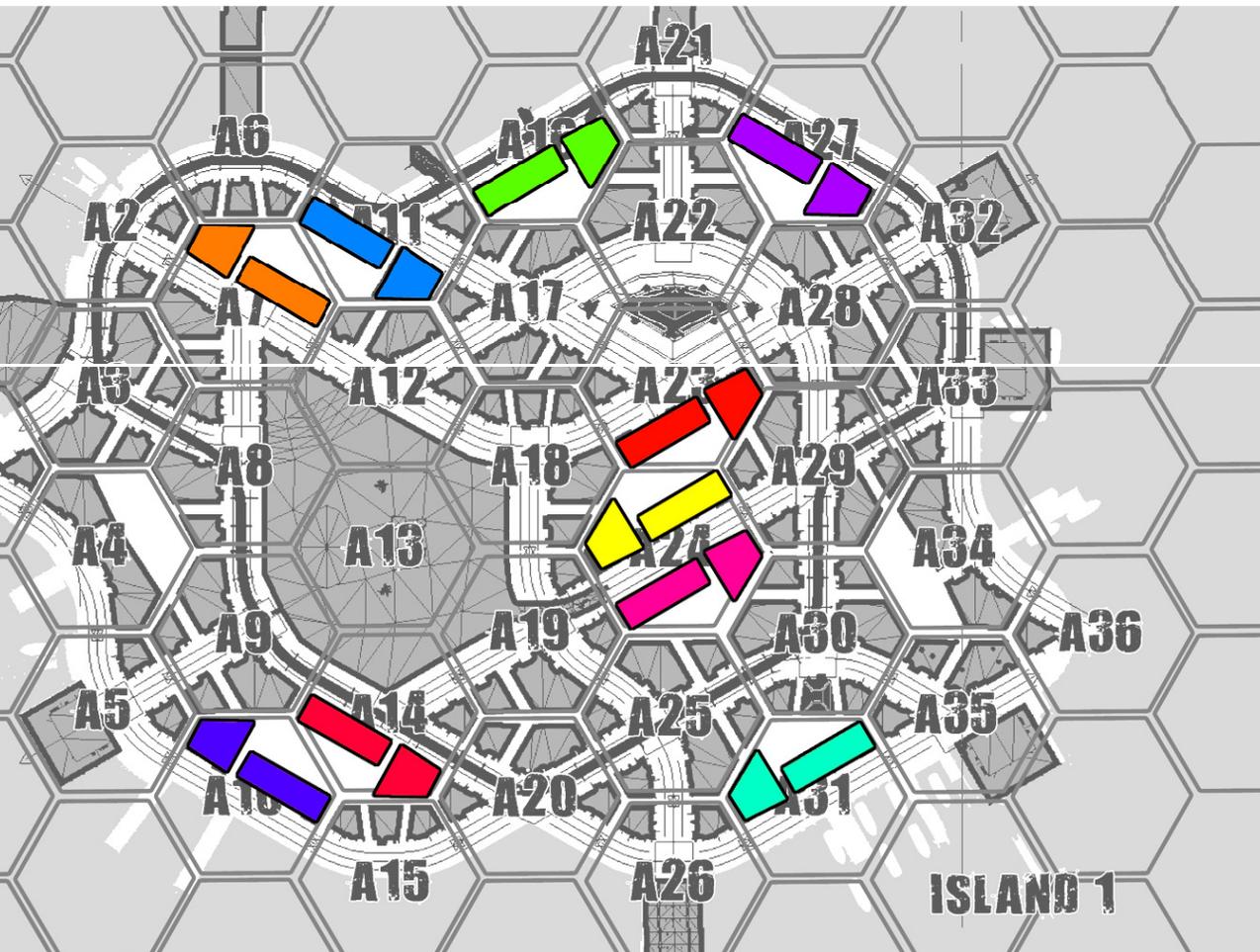
Here's a good shot of just how a building footprint works in conjunction with the hex edge. See how street defines the sidewalk and then the building is built right up to the edge of the sidewalk? The alley space behind the building is where the Hexes join up. That way, the buildings don't need touch each other.

Building Footprints – Functional Stand-ins



- All of the different colored buildings to the left are identical.
- By creating one version of a building footprint, you can insert it in all spaces that accept that footprint.

Building Footprints – Footprint Swapouts



- This means you can “art out” your game relatively quickly... then replace the duplicated structures as desired time permits.
- You’d be surprised how hard it is to spot the repetition of the base structure.

Building Footprints – Building Variety



- Creating two completely different buildings for the same hex footprint is an option...
- ...Yet what people really tend to notice are the details- stuff like signs and storefronts, not the bricks.

Building Footprints – Building Variety



The street level of our buildings had pre-set holes carved out for storefronts so that way artists could mix & match different stores with buildings.

Building Footprints – Building Variety



By creating standardized store “footprints” early on, you can easily fill up the same world and then replace what you’d like if you’ve got the time.

Building Footprints – HSV Shifting



- Some objects (both on street level and on buildings) can be given a lot of variety through HSV shifting the object's textures.

City Layout

Here are some cheap tricks we used to make our city feel that much bigger...

Sight Lines

Y Intersections

Weenies

Identity of Spaces

Gated Content





City Layout – Sight Lines

- We always try to avoid looking down long lanes of empty space.
- Running down these streets gives you the feeling that you're not moving very fast because you don't reach your visual objective very quickly.
- Employing long straight streets also cuts down the number of conceptual streets in the city (after all, you only have so many square kilometers to work with).

City Layout – Y Intersections



- Streets and alleys that end in Y Intersections are ideal because they block long sight lines.
- They also function well for nice reveals as the player rounds the corner.
- Y Intersections are also very camera friendly; since they're obtuse angles it's easier for the camera to get around them without getting snagged.

City Layout – Weenies (Distinctive Architecture)

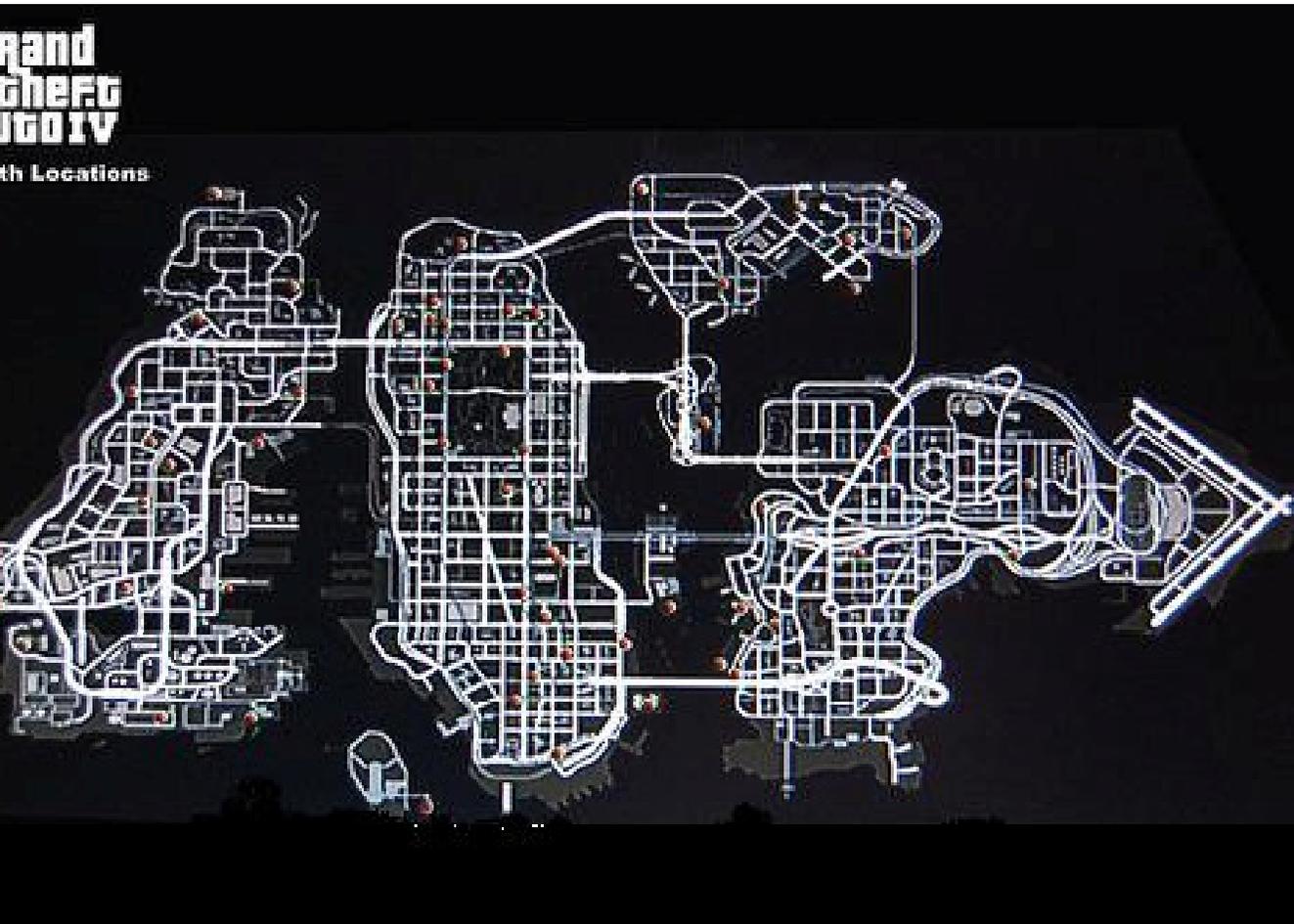


- Of course, at some point your Player will want to catch their bearings. Adding tall “weenies” in high profile spots will provide identity to a neighborhood.
- If you’ve reused a lot of architecture earlier on that means you can spend more time working on this sort of building... the kind of structure people care about.
- Weenies are ideal places to create mission specific, “one off” geometry.

City Layout – Identity of Spaces



- Ideally each street should have a high profile element to give it identity.
- This is primarily to help make the city feel less repetitive... and to also help with player navigation.
- We used a combination of signage, train tracks, riot damage, blast damage, weenies, Jumbotrons, shoreline access and park space to do this.



City Layout – Gated Content

- Of course, players will want more content as the game progresses. In open world games you need to give Players a lot of square kilometers early on... and then unlock even more later to keep them interested.



City Layout – Gated Content

- Happily, since unlockable content is initially unavailable, a Player's imagination will fill it in as "BIG". They've yet to run around in it and get bored.

Organic Spaces

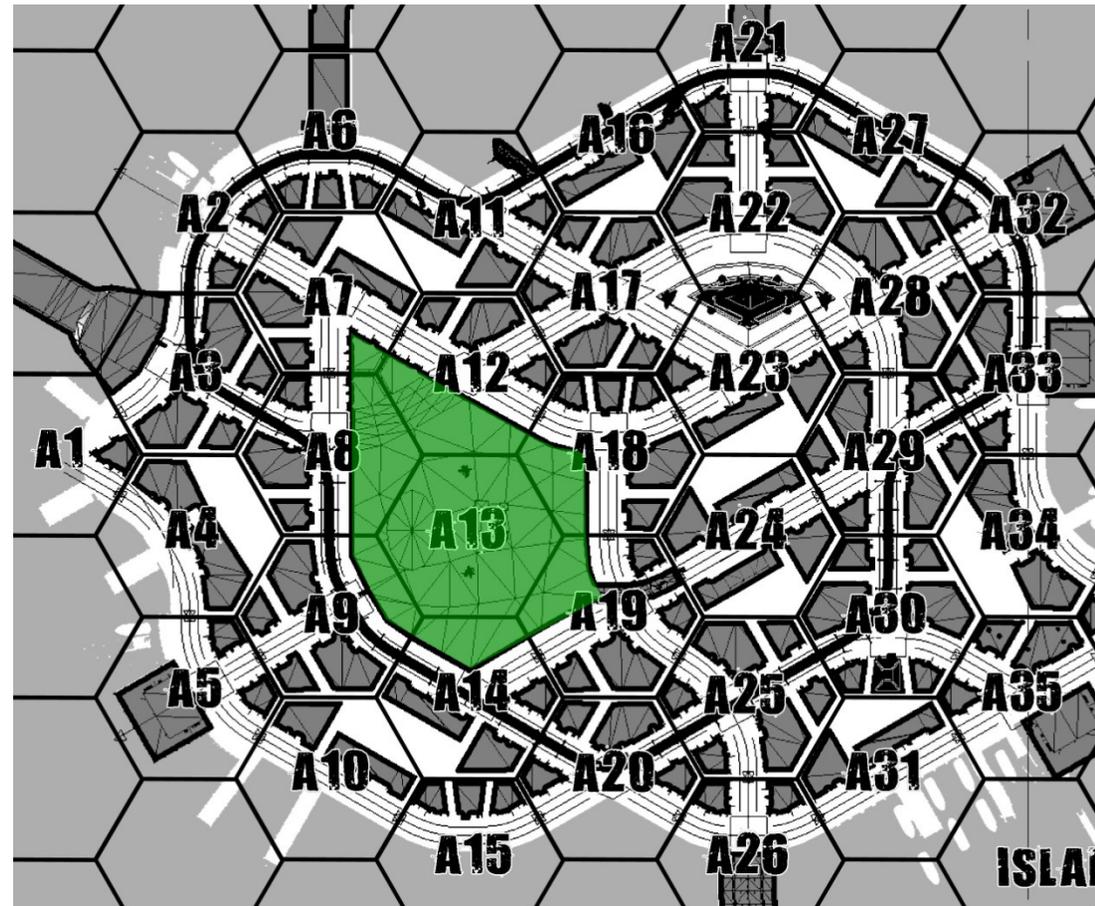
Organic spaces don't need to be built block step with sidewalks. They come one-off areas that extend over many building footprints.

- Parks
- Destroyed Areas
- Sea Space



Organic Spaces - Parks

We created a one-off mound of grass to cover this large area of the city.



Organic Spaces - Parks

Since parks mainly consist of repeated plants this isn't a disaster from a modeling standpoint.

They're also easy places to add elevation variety.



Organic Spaces – Destroyed Areas

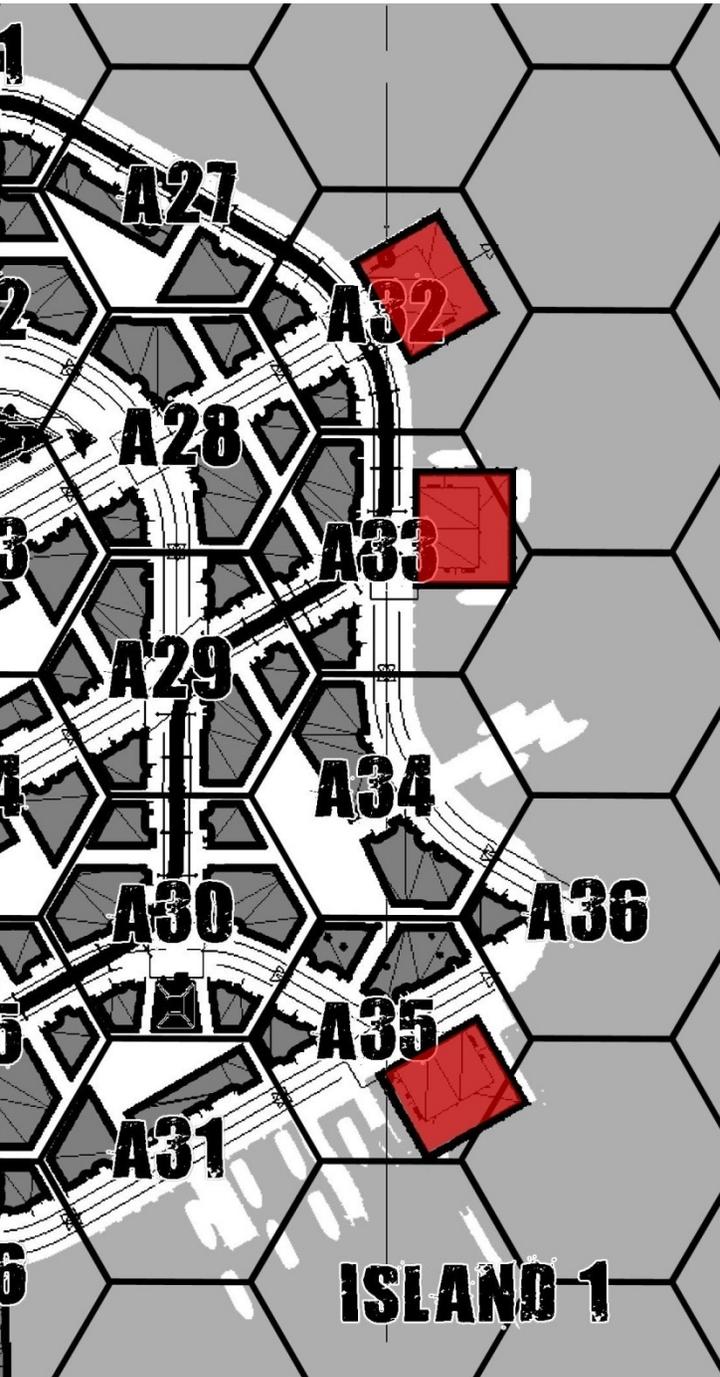


- Destroyed areas are identical to parks in their construction process... just replace grass with rubble.

Organic Spaces – Sea Space



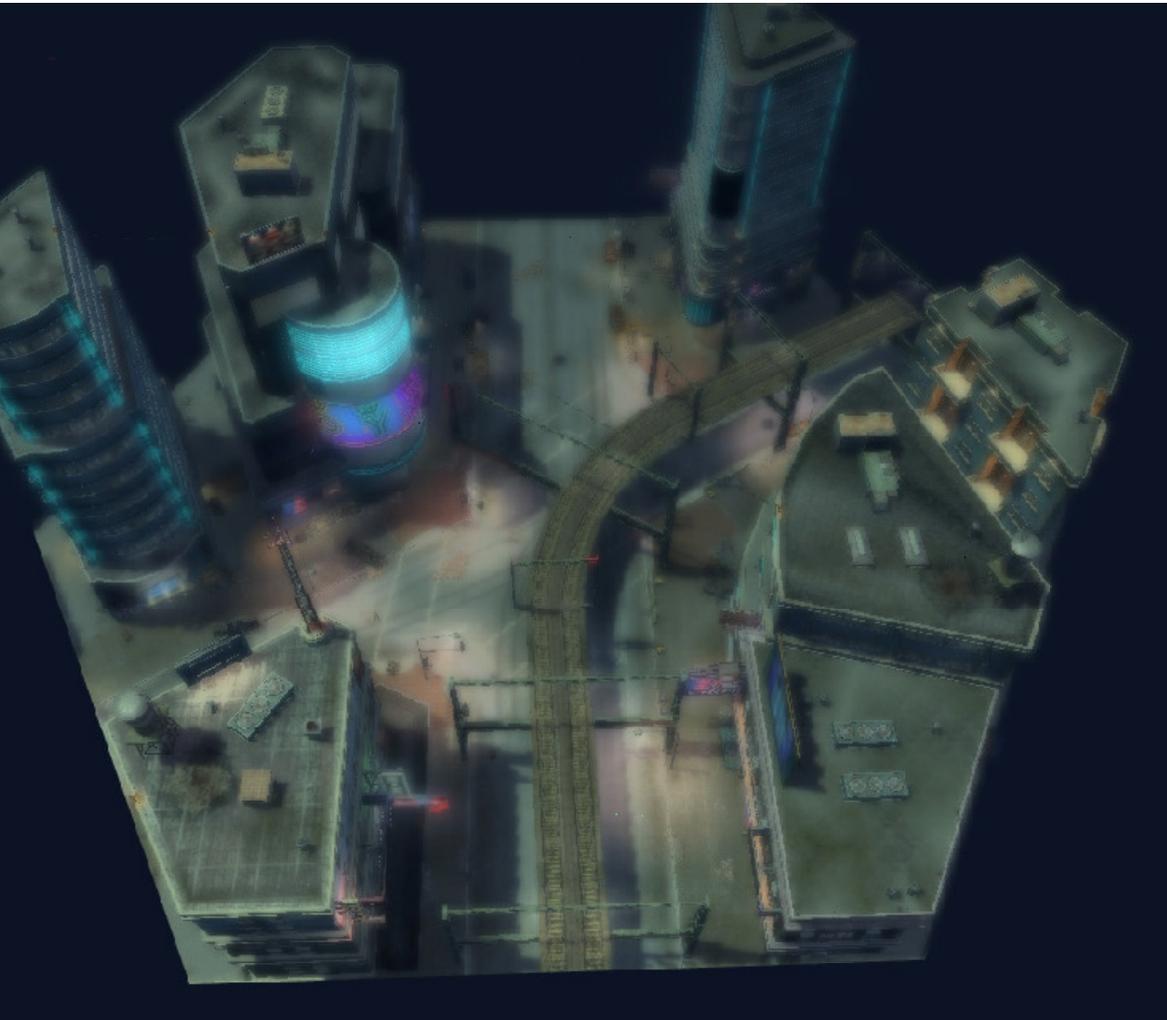
At the edge of a shoreline hex artists placed assets wherever they'd like since nothing has to line up. This leads to some cool organic rock and junk formation



Organic Spaces – Sea Space

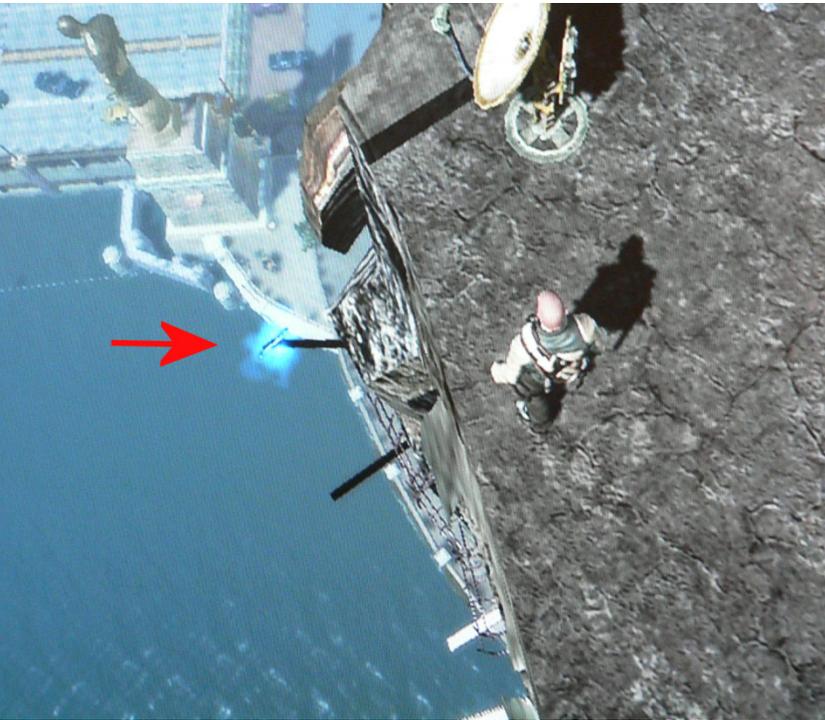
- Also, waterfront warehouses are fantastic line-of-sight blockers.
- Players aren't able to tell just how small an island really is when looking down a street towards the water, because all they see is another building.

Steaming Issues



- We used the standard hex tile as the basic unit for our streaming engine.
- At some point you need to decide what you're going to load in and out. Ultimately, our city construction process heavily influenced how we did it.

Collectibles help leverage the art



- Placing collectibles around the world helps drive players into places they might not normally go.
- Enhances sense of exploration.



The Cons

Our system is good for making content relatively fast, but there are some real negatives...

- Hex building footprints can make for odd shaped buildings.
- Hex system (and Y intersections) can make it easy for the player to get lost.
- Lack of standard four way 90 degree traffic intersections is unrealistic.
- Space between buildings and alley widths are always equivalent.

The Cons

Alleys are problematic

Uniform alley edges are the same everywhere you go, and it's hard to easily make them unique as they straddle two hexes.

Alley textures need to always be the same (so that edges line up) and it creates repetition.

The space between hexes is hard to determine who has ownership.

Conclusion



Reuse is fantastic because it lets you focus on that stuff that matters to both you and to gamers.

Creating geometry footprint guidelines (for roads, buildings and storefronts) allows you to experience a large world early on. This is incredibly useful for mission creators as they won't be tied to the Artist's schedule.

Questions?

