Project Rhino:
Competitive Site Location Benchmarking for Semiconductor Manufacturing

Full Report

Prepared for:

Prepared by:

September 30, 2018
1. **Project Background** (pg. 4)
   Summary of clients interest and previous semiconductor history, objectives, approach and geographic focus.

2. **Location Quality Assessment** (pg. 9)
   Summary of selected locations, MCDA description and results.

3. **Location Cost Assessment** (pg. 24)
   Detailed order of magnitude analysis of location-sensitive costs, including one-time and ongoing operating costs.

4. **Economic Incentives Assessment** (pg. 35)
   Detailed assessments of state and local economic incentives capacities and order of magnitude feasibility analysis.

5. **Overall Findings** (pg. 42)
   Synthesis of location, cost, and incentives analyses, which produced an overall assessment of examined locations.
Newmark Knight Frank (NKF)’s Global Corporate Consulting practice assembled the following core team members to execute this consulting engagement. The team represents a wide variety of relevant subject matter expertise and geographic experience.
1. PROJECT BACKGROUND

Newmark
Knight Frank
The New York State Economic Development Council (NYSEDC) engaged Newmark Knight Frank (NKF) to perform a strategic evaluation of four sites throughout Upstate New York to understand each location’s competitive positioning to attract semiconductor plants, and compare the New York locations against six other competing locations around the country. This became known as “Project Rhino”.

NKF has previously conducted active site selection searches with “live” clients in the Semiconductor industry – most recently including “Project Trace” (2013/14) and “Project Inverness” (2016/17). NYSEDC’s interest in performing a Semiconductor benchmarking analysis (later known as Project Rhino) stemmed in part from its participation in the site selection process for Project Trace. New York was a finalist in Trace but ultimately not selected – as a result of this process, the state took a proactive approach to understanding how they can continue to enhance their competitive positioning in this high value industry that includes a narrowing number of corporate players.

For Project Rhino, NKF conducted a mock site search for a hypothetical semiconductor company and fab investment whose facility and business needs closely mirrored those of the client for Project Trace. NKF evaluated four New York sites and communities as well as six others in competitive states throughout the country to understand the strengths and challenges of each as it relates to attracting a next generation semiconductor chip fab facility.

To this end, NKF has preformed an in-depth analysis for Project Rhino measuring qualitative compatibility and cost competitiveness as well a benchmarking of the potential economic incentives at each location that may be provided to projects of this considerable scale. The information generated from this competitive benchmarking exercise will allow the State of New York and its local economic development partners to understand their strengths, weaknesses, and relative competitiveness within the US market.
Project Rhino
Three Primary Objectives

Project Rhino is a strategic evaluation, profiling, and benchmarking to determine the suitability of four New York sites for the semiconductor industry. The three objectives for this exercise are:

1. **Benchmarking (vs. industry needs)**
   Examine the four New York sites with regard to their merits and challenges – profile and analyze these sites to understand to what extent they satisfy the unique needs of the industry.

2. **Benchmarking (vs. top US sites)**
   Compare the New York sites against competitive alternatives in six other US states possessing a proven track record attracting semiconductor companies are that or actively pursuing this industry.

3. **Alternative Uses**
   For the four New York state sites, explore potential additional uses (outside of the semiconductor industry) that could have higher utility or produce better results sooner if marketed to another industry.
Project Rhino

Project Approach and Geographic Scope

Project Rhino was undertaken over a five month period between June and October 2017. The project approach and process included these key activities:

1. Issue a needs assessment
2. Develop project specifications
3. Location and site identification
4. Create a weighted critical local criteria framework
5. Community and site tours
6. Request for Information (RFI) process
7. Create a performance scorecard to compare all sites on qualitative factors and perform a gap analysis for NY sites
8. Compare all sites on fixed and operating costs (including economic incentives)
9. Consider state and local opportunities to improve business attractiveness

Selected Benchmark States:

- Competitive sites in six states were used for benchmarking
- States were chosen based on the understanding that they would have the interest, capability, and capacity to support a project similar in scope to Rhino
- These states also provide a diversity of geography and business climate that further enriches the analysis
- Five states currently have a semiconductor industry presence
- Only Ohio has never had a semiconductor presence and is considered a “Pioneer State” now in pursuit of this industry
All locations (NYS sites and competitive US benchmark locations) have been evaluated using an analytical framework comprised of the following components:

1. **Quality**
   To test a location’s suitability for future Project Rhino operations, qualitative data was measured using the Multi-Criteria Decision Analysis (MCDA) framework. Through this process, 108 critical location data points were evaluated and the results provided an overall score and ranking for all sites to understand the strengths, weaknesses, and competitive positioning of each.

2. **Cost**
   Major location-sensitive operational and investment costs were assessed using a 10-year net present value (NPV). The cost model incorporates initial real estate and facility construction costs, plus associated taxes. Ongoing operating costs including human resources, utilities, and taxes were calculated for each site and escalated over time.

3. **Incentives**
   Estimates of economic incentives by program type and use were gathered in the RFI response and augmented through dialogue with each state economic development organization. The non-negotiated incentive values represent an order-of-magnitude estimate of potential, and were applied as a cost offset across the 10-year duration of the cost model.

The above components merge into an overall assessment of the New York sites versus the other location alternatives. The results illustrate NY’s *comparative opportunity* to improve its operating environment while also reducing costs, in part via incentives.
2. LOCATION QUALITY ASSESSMENT

Newmark
Knight Frank
NKF performed an assessment of key site and community attributes in order to benchmark the chosen New York State subject sites versus competitive sites located in other US states possessing a history of attracting or competing for companies in the Semiconductor industry.

**Included in this Section:**

- Introduction to NYS subject sites and US competitive benchmark locations
- Scoring methodology - Multi-Criteria Decision Analysis (MCDA)
- Critical location factors (and weightings) scored for MCDA location analysis
- Results – summary of total scores and rankings
- Results – score summary by primary criteria
- New York State competitive positioning (strengths and challenges)
- Community and site profiles (NYS and national benchmarks)
Four locations throughout Upstate New York were chosen as the subject sites for Project Rhino.

New York State Subject Sites:

1. **STAMP**
   Alabama (Genesee County)
2. **White Pine**
   Clay (Onondaga County)
3. **Marcy Nanocenter**
   Marcy (Oneida County)
4. **Luther Forest Technology Campus**
   Malta (Saratoga County)
The State of New York and NKF team elected to evaluate one representative site within each of six competitive state for comparison.
Location Quality Assessment
Multi-Criteria Decision Analysis (MCDA)

To provide a comparative assessment comparing the quality of each of the sites, NKF examined 108 geographically variable factors and scored each within a weighted variable framework through the MCDA process. All of these “critical location factors” were chosen, weighted, and grouped according to Project Rhino’s specific needs. The Primary Criteria and weightings include the following:

- **Site Quality and Suitability – 20%**
  Development readiness, site compatibility, access, ownership, business continuity risks.

- **Workforce and Community Alignment – 25%**
  Workforce composition, contractors, and vendors, educational resources, industry dynamics, and quality of place.

- **Utilities: Capacity, Quality and Reliability – 25%**
  Electricity, natural gas, water, and wastewater were assessed based on current and future capacities, and costs.

- **Economic Development and Regulatory Context – 15%**
  Permitting, air attainment, tax treatment of property, and more.

- **Incentive Capacity and Capability – 15%**
  State fiscal health, political support, economic development alignment, and statutory vs. discretionary approaches.
Primary Criteria 1: Site Quality and Suitability

The chart illustrates the quality assessment scores for this particular primary criteria in descending order. Larger bars and higher scores are optimal. A perfect location would score 1.00 in this model.

Key Findings:
- Marcy, NY ranked the highest of NY sites on Development Readiness and Local Transportation Access and Quality.
Location Quality Assessment
Scores by Primary Criteria

Primary Criteria 2: Workforce and Regional Alignment

The chart illustrates the quality assessment scores for this particular primary criteria in descending order. Larger bars and higher scores are optimal. A perfect location would score 1.00 in this model.

Key Findings:

- STAMP is the highest scoring New York site pulling workforce from Rochester and Buffalo.
- LFTC in the Capital Region has the strongest R&D capacity in New York to support innovation across the semiconductor supply chain.
- Semiconductor research & technical expertise across the New York “ecosystem” is very high but site scores were lower due to market size and workforce scalability for a mega-fab.

Criteria Weight: 25%
Location Quality Assessment
Scores by Primary Criteria

Primary Criteria 3: Utilities – Capacity, Quality, and Reliability

The chart illustrates the quality assessment scores for this particular primary criteria in descending order. Larger bars and higher scores are optimal. A perfect location would score 1.00 in this model.

Key Findings:
- Marcy scored the highest for having the best electricity, natural gas, water and wastewater infrastructure.
- White Pine is the second best site because of its good electric, water and wastewater infrastructure.
Location Quality Assessment
Scores by Primary Criteria

Primary Criteria 4: Economic Development and Regulatory Context

The chart illustrates the quality assessment scores for this particular primary criteria in descending order. Larger bars and higher scores are optimal. A perfect location would score 1.00 in this model.

Key Findings:

- Marcy scored high in every category: Project Facilitation and Permitting, Tax Treatment of Operations, and EDC Leadership and Experience with STAMP closely following.

- New York sites occupied three of the top five rankings for economic development and regulatory support of this semiconductor investment.
Location Quality Assessment
Scores by Primary Criteria

Primary Criteria 5: Incentive Capacity and Capability

The chart illustrates the quality assessment scores for this particular primary criteria in descending order. Larger bars and higher scores are optimal. A perfect location would score 1.00 in this model.

Key Findings:
- All sites in the state of NY scored high in Statutory vs. Discretionary Incentive Approach, Experience and Ability to Make Legislative Changes, and Political Support and Alignment.

Criteria Weight: 15%
**Location Quality Assessment**

**Scores by Primary Criteria (Cumulative)**

### Qualitative (Non-Cost) Assessment Results

**Overall Location Scores for all Criteria and Sub-Criteria**

Average of All Locations = 90.9

<table>
<thead>
<tr>
<th>Location</th>
<th>Site Quality and Suitability</th>
<th>Workforce and Regional Alignment</th>
<th>Utilities - Capacity, Quality and Reliability</th>
<th>Economic Development and Regulatory Context</th>
<th>Incentive Capacity and Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY - STAMP</td>
<td>16.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NY - Clay</td>
<td>16.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NY - Malta LFTC</td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NY - Marcy</td>
<td>15.7</td>
<td></td>
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</tr>
</tbody>
</table>

**NY Loves Nanotech**

New York is notable in part because the state and industry partners have invested over $20 billion in its nanotechnology industry cluster over the last 20 years.

Not every NY site assessed for Project Rhino is ready and able to support a mega-fab but the region is positioned well to support and grow technology research and development.

The Albany Capital region ranked second in the U.S. for semiconductor device manufacturing process patents in 2014 and 2015. At its Fab 8 chip plant in Saratoga County, for instance, GLOBALFOUNDRIES employs more than 3,000 people and maintains its global R&D center.

Educational institutions with engineering to support nanotech include SUNY Polytechnic Institute; Colleges of Nanoscale Science and Engineering; Cornell University; Rochester Institute of Technology, Clarkson University; Rensselaer Polytechnic Institute (RPI), and others.
## Location Quality Assessment
### Overall Scores and Rankings for MCDA Factors

#### Qualitative (Non-Cost) Assessment Results
NYS vs. National Benchmarks

<table>
<thead>
<tr>
<th>State</th>
<th>Rank</th>
<th>Score</th>
<th>National Benchmarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>#5</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>STAMP</td>
<td>#4</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>MARCY</td>
<td>#1</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>OREGON</td>
<td>#2</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>OHIO</td>
<td>#3</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>TEXAS</td>
<td>#6</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>VIRGINIA</td>
<td>#7</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>UTAH</td>
<td>#9</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>MALTA</td>
<td>#10</td>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>

Max = 110  Min = 70
## Location Quality Assessments
### Competitive Ranking Scorecard

#### Qualitative (Non-Cost) Assessment Results
Relative Scores by Primary Criteria

<table>
<thead>
<tr>
<th>Primary Criteria</th>
<th>STAMP</th>
<th>White Pine</th>
<th>Marcy</th>
<th>LFTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Quality and Suitability</td>
<td>0.80</td>
<td>0.82</td>
<td>0.93</td>
<td>0.71</td>
</tr>
<tr>
<td>Workforce and Regional Alignment</td>
<td>0.62</td>
<td>0.34</td>
<td>0.31</td>
<td>0.40</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.60</td>
<td>0.87</td>
<td>1.00</td>
<td>0.52</td>
</tr>
<tr>
<td>Economic Development and Regulatory Context</td>
<td>0.92</td>
<td>0.80</td>
<td>0.97</td>
<td>0.74</td>
</tr>
<tr>
<td>Incentive Capacity and Capability</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**OVERALL**

|              | 5 | 8 | 4 | 10 |

1.0 = highest score in competitive set

**New York State**

- Green = Highest Tier (> 0.90)
- Yellow = Lowest Tier (<= 0.50)
# Location Quality Assessment

## Competitive Strategy and Positioning

<table>
<thead>
<tr>
<th>Location Quality Rank</th>
<th>Competitive Strengths</th>
<th>Competitive Challenges</th>
</tr>
</thead>
</table>
| **Marcy Nanocenter**  | + Utility site readiness – capacity, quality, and reliability  
                         + Transportation access and quality  
                         + Incentive capacity and capability  
                         + Area industry resources  | – Regional workforce (size and quality)  
                         – Talent pipeline (higher education)  
                         – Contractor capacity  
                         – Airport accessibility  
                         – Quality of place / recruitability  |
| **Marcy**  
**Oneida County**  | #4  | |
| **STAMP**  
**Alabama**  
**Genesee County**  | + Single ownership of site/ ability to control  
                           + Incentive capacity and capability  
                           + Long-term development vision  
                           + Access to both Buffalo & Rochester  | – Utility site readiness – cost and time to get “shovel ready”  
                           – Local transportation access  |
| **White Pine**  
**Clay**  
**Onondaga County**  | #5  | |
| **Luther Forest**  
**Malta**  
**Saratoga County**  | + High-quality business park environment  
                           + Incentive capacity and capability  
                           + Proximity to Albany & Saratoga supply chains  | – Inadequate land parcel size  
                           – Utility site readiness – timing and possible fatal flaws on capacities  
                           – Capacity and scalability of regional workforce  |
| **Luther Forest**  
**Malta**  
**Saratoga County**  | #8  | |
| **Luther Forest**  
**Malta**  
**Saratoga County**  | #10  | |
For non-cost variables, New York State possesses many advantages that provide the Empire State with a strong competitive positioning that will allow them to go to market aggressively to attract new companies within the Semiconductor industry.

**New York’s Strongest Industry Selling Points:**
- Incentive capacity and capability is the best in the US
- Track record of offering and delivering on incentives for this industry
- Favorable tax environment to support ongoing operations
- One of the top shovel-ready mega-sites in the US at Marcy
- Statewide eco-system to support this industry

**New York’s Impediments to Industry Attraction:**
- Scale and capacity of workforce and development of talent pipeline
- Quality of place and recruitability to Upstate NY markets
- Marcy is only truly shovel-ready mega site, though Clay is getting much closer. STAMP is ready today for small and mid-sized projects but requires substantial investment and time to be fab-ready. LFTC is ready but only has capacity for a much smaller project within the semiconductor supply chain.
3. LOCATION COST ASSESSMENT

Newmark
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In addition to the Multi-Criteria Decision Analysis (MCDA) framework that was used to prepare qualitative assessments of competing sites and communities, NKF has prepared a detailed cost analysis of each New York and each out-of-state benchmark location.

The backdrop to NKF’s cost analysis includes the following considerations:

- Manufacturers operate in a high growth, highly competitive, and very capital intensive business with rapid turnover of invested capital. As a result, they are under constant pressure to reduce costs and operate at maximum efficiency.

- The cost structure of the semiconductor business is overwhelmingly consumed by three items: capital costs and associated depreciation, raw materials, and parts & maintenance.

- Approximately 20 – 30% of semiconductor manufacturing costs are location-sensitive, and these are the focus of NKF’s cost analysis:
  1. Construction costs (one-time)
  2. Electricity
  3. Natural gas
  4. Water and Waste Water
  5. Personnel / Human Resources
  6. Taxes and Incentives

Note: The cost analyses in this report have been prepared on an order-of-magnitude basis for benchmarking purposes only. Quotations of costs and incentives from economic developers and utilities are non-negotiated, directional estimates only. Other assumptions, caveats, and restrictions are noted below and in the appendix.
Location Cost Assessment
Cost Factor Details: Property & Construction (One-Time)

Conceptual Project Specifications:
- 300 acres of property with a roughly square (3,600’ x 3,600’) or slightly rectangular configuration
- Assumed 2.5MM square feet of facility under roof (functional breakdown included in RFI) with an estimated gross construction cost of $1,000 per square foot for site, on-site utility, and building costs
- One-time construction cost assumed to be $2.5B
- Location adjusted construction costs are based on the 2016 edition of RS Means, and includes variations in construction materials, labor wages, and rental equipment for industrial construction

Property & Construction Costs
- High: $2.48B
- Low: $1.95B
- High/Low Variance: $525M or 21%
- The NY sites occupy 5 of the top 6 most expensive locations to build a new semiconductor fab, and land prices are not a significant contributor to the cost
- The southern state options are the low cost development locations, generally

Note: For a real project, cost differentials are likely to be less than stated in the benchmark data due to the unique and specialized nature of the construction, the materials used, and trades employed.
Location Cost Assessment
Cost Factor Details: Electricity

**Conceptual Project Specifications:**
- 150 MW load with 100% redundancy at 115kv, with 0.95 load factor.
- A contemplated Phase 2 expansion requirement would double the required load with 100% redundancy creating a demand of 300 MW.
- Multiple (2 - 4 times) redundancy of electrical transmission and delivery to site was requested.
- Quoted rates include generation, transmission, and distribution to the site, inclusive of off-site capital spending by the utility. Rates do not include redundant demand or other miscellaneous charges.

**Electricity Costs, ~ 80% of Total Utilities**
- High: $560M
- Low: $371M
- High/Low Variance: $189M or 34%
- Batavia, NY ranks the lowest for electricity costs overall, followed by all other NY sites by a differential of around $74M or 17%
Location Cost Assessment
Cost Factor Details: Natural Gas

Conceptual Project Specifications:
- 2,000 cfm, uninterruptable service, at minimum 40 psi.
- Contemplated Phase 2 expansion requirement is expected to be 4,000 cfm.
- Monthly consumption of 89,000 MMBTU

Natural Gas Costs
- High: $55.2M
- Low: $18.0M
- High/Low Variance: $37.2M or 67%
- All NY sites have lower natural gas costs than all other out-of-state sites, due in part to Excelsior discounts
- Batavia, NY has the highest gas costs among NY sites.

Estimated Natural Gas Costs, 10-Year Total NPV

- Batavia, NY: $22
- Marcy, NY: $20
- Malta, NY: $18
- Clay, NY: $18

$ Millions
-$60.00 $50.00 $40.00 $30.00 $20.00 $10.00 $0.00

Newmark Knight Frank

Project Rhino 28
Location Cost Assessment
Cost Factor Details: Water

Conceptual Project Specifications:
- Municipal water service delivering 6M GDP, with gray water not usable as primary water source
- Contemplated Phase 2 expansion requirement is expected to be 12M GPD.
- Roughly 17% of this is lost or consumed in the production process, the balance going to wastewater sewer.
- Several locations under consideration will need to significantly expand water processing and delivery systems. Quoted consumption rates are assumed to include any system-wide capital costs.

Water Costs
- High: $151.7M
- Low: $17.1M
- High/Low Variance: $134.6M or 89%
- Clay, NY is the New York site with the lowest water costs of $23.4M

![Graph showing estimated water costs, 10-Year Total NPV]
Wastewater Costs

- High: $77.2M
- Low: $13.5M
- High/Low Variance: $63.6M or 82%
- Clay NY has the lowest wastewater costs in New York and Batavia the highest (nearly double)
**Location Cost Assessment**

**Cost Factor Details: Personnel**

**Conceptual Project Specifications:**
- 24/7/365 operation
- More than 1,600 permanent jobs at commencement growing to 2,100 over 4 years.
- Facility-wide average annual salary of $64,000.
- Benefits package paid, estimated at 27% of base comp.

**Occupational mix includes:**
- Management (45)
- Engineers (550)
- Technicians (700) with 2-year associate degrees or 4-5 years of experience
- Machine & Tool Operators (180) high school and community college grads
- Shared Services Administration (125)

**Personnel/Labor Costs**
- High: $1.0B
- Low: $890M
- High/Low: $118M or 12%
- The four metros with the highest wage costs are all currently home to one or more semiconductor fabs.
- Marcy and Batavia NY are the next two low labor cost markets, separated by only 2% or $10M over 10 years.

![Estimated Labor Costs, 10-Year Total NPV](image)
Conceptual Project Specifications:

- Taxes included within the cost and incentive model estimates included: Real property; Business personal property; and Sales and Use Tax on construction materials.
- Tax avoidance from tax statutes are treated as pure cost avoidance rather than “incentives”.
- Tax rates were provided by the economic developers through the RFI process. Rates used in the cost model have been adjusted according to the RFI responses and or direct guidance from each state. Tax reductions, exemptions, abatements and credits are covered in the Incentives analysis.
- All figures are order-of-magnitude estimates and do not constitute tax advice or planning guidance.

Taxes on Construction (One-Time) & Operating Taxes (Ongoing)

- High: $1.53B
- Low: $188M
- High/Low: $1.3B or 88%
- All NY sites have the same taxes based on current assumptions

Estimated Construction Taxes & Operating Taxes, 10-Year Total NPV

<table>
<thead>
<tr>
<th>Location</th>
<th>Estimated Cost (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcy, NY</td>
<td>$1,028</td>
</tr>
<tr>
<td>Malta, NY</td>
<td>$1,028</td>
</tr>
<tr>
<td>Clay, NY</td>
<td>$1,028</td>
</tr>
<tr>
<td>Batavia, NY</td>
<td>$747</td>
</tr>
</tbody>
</table>

$ Millions
Location Cost Assessment
Cost Modeling Summary: Total Capital Investment & Recurring Costs

The stacked bar chart displays the estimated, order-of-magnitude costs for Project Rhino’s one-time capital investment plus 10 years of recurring operating cost (NPV), without incentives.

- High/Low: $1.4B or 10%
- All NY locations have similar costs, Malta being the most expensive option.
- The next section examines the opportunities for, and potential value impacts of, incentives upon total estimated costs.

![Stacked Bar Chart]

- Total Capital Investment
- Total Human Resources
- Total Utilities
- Total Taxes

[Insert chart details here, if applicable]
Location Cost Assessment

Cost Modeling Summary: Total Recurring Costs

The stacked bar chart displays the estimated, order-of-magnitude costs for 10 years of Project Rhino’s recurring operating cost (NPV), without incentives.

Average: $2.62B
4. ECONOMIC INCENTIVES ASSESSMENT

Newmark Knight Frank
Economic Incentives: Feasibility Purpose & Methodology

To more fully understand the cost competitiveness of New York site locations versus their US location alternatives, Project Rhino included a feasibility assessment of economic incentive programs and financial opportunities for all sites under review.

To be as comprehensive as possible and also remain within the scope of this competitiveness study, NKF undertook a research and assessment process that included the following steps:

- Create project parameters that would facilitate a fair comparison of incentives for each state;
- Issue and analyze a detailed Request for Information for each state and local jurisdiction;
- Conduct additional community and business research pertaining to all program opportunities;
- Evaluate the incentives potential for key statutory and discretionary programs for each location;
- Prepare order-of-magnitude financial models to analyze the impact of major incentives programs;
- Integrate the incentives calculations with the overall business cost model for each location, thus allowing location-sensitive cost estimates to illustrate the potential net impact of incentives;
- As necessary, fill information gaps or deliberate omissions with data from prior project experience;
- Use information from the RFI, interviews, and research to illustrate within the Multi-Criteria Decision Analysis (MCDA) model each location’s capability and capacity to deliver incentives value for a semiconductor project of this type.

Some “Fast Facts” and “Feasibility Highlights” from each state are presented below.
State economic development agencies were the primary points of contact for incentives information, although NKF engaged directly with regional, local, and utility organizations in many locations, as well.

Over 40 incentives programs were assessed, and 31 quantified for inclusion in the financial models.

**Economic Incentives:**
Fast Facts from Feasibility Assessment

- **31 Incentive Programs Quantified**
- **$10.3B Aggregate Incentives Value**
Economic Incentives:
Total Incentives Feasibility Estimate, by Program Type

Key Findings & Metrics

Based on the feasibility assessment of non-negotiated incentives programs in all New York and benchmark states and communities, the following key findings emerge:

- **Highest 10-Year Total Package: $1.39B – NY average**
  - The New York locations are similar despite small variations in local taxes and incentives structures. We assume that these would equalize in a truly competitive live project situation.

- **Tax abatement** to reduce real and personal property taxes are the notable features in most states, which substantially reduce structural costs but deliver less direct value to the company investor. New York and Ohio are unique in not charging tax on business personal property, which is a permanent form of cost avoidance compared to other locations.

**New York is notable** for providing grants and cash equivalent incentives (e.g. refundable tax credits) that comprise over 80% of the total incentives package value in all of the NY locations. This incentives structure provides maximum benefit to the company investor.
Key Findings & Metrics

10 Year Incentives Totals (NPV), by Major Type

- Batavia, NY
- Clay, NY
- Malta, NY
- Marcy, NY

Millions

- Grant or Cash Equivalent
- Real Property Abatement
- Personal Property Abatement
- Sales & Use Tax Abatement
Economic Incentives: Discussion

Key Findings & Metrics

- The value of each community’s total incentives package are summarized here as a “share of total investment” and on a “per job” basis:

<table>
<thead>
<tr>
<th>Metrics</th>
<th>Marcy, NY</th>
<th>Malta, NY</th>
<th>Clay, NY</th>
<th>Batavia, NY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives as a % of Capital Investment</td>
<td>12.99%</td>
<td>12.65%</td>
<td>11.89%</td>
<td>11.72%</td>
</tr>
<tr>
<td>Incentives Value per Job Created</td>
<td>$688,231</td>
<td>$675,482</td>
<td>$632,638</td>
<td>$627,251</td>
</tr>
</tbody>
</table>

- Compared to the results of NKF’s benchmarking research, it would seem that the value of the Project Rhino incentives packages are generally “under-performing” as a percentage of capital investment and “over-performing” with respect to new jobs created. These results are expected given how relatively large the Project Rhino capital investment will be; and given how few jobs are created for an investment of this size.

- Within the scope of this benchmarking exercise, NKF has validated proposed incentives programs and confirmed program eligibility. Programs that require legislative changes or additional discretionary action by legislatures or governors cannot be estimated or confirmed. Certain estimates of incentives conservatively factored in increased funding based on prior project experience to provide a more accurate assessment of incentive capabilities. NKF expects that the incentives packages for a semiconductor fab would change and increase in value in the event a real project was considered.
Economic Incentives: Qualitative Assessment of Probability & Value Potential

- In addition to the preliminary incentive analysis, NKF has prepared subjective “Ratings” for each state based on our prior experience, research, interviews, and responses.

- An “Overall Assessment” of each location is based on NKF’s opinion of that state, local, and utility economic incentives response-to-date. The evaluation scale is 1 (lowest), 3, 5, 7, and 9 (best).

- We also rate the “Additional Value Potential” at each location both in terms of the “Probability” that a better incentives offer would be made for a live project, and by our subjective estimate of the relative “Value” of the additional incentives offer. The Probability and Value are both measured in terms of Low, Med., or High in each case.

<table>
<thead>
<tr>
<th>Overall Assessment: Scored 1, 3, 5, 7, 9</th>
<th>NY</th>
<th>TX</th>
<th>OH</th>
<th>OR</th>
<th>AZ</th>
<th>UT</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Value Potential: Probability &amp; Value</th>
<th>NY</th>
<th>TX</th>
<th>OH</th>
<th>OR</th>
<th>AZ</th>
<th>UT</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium &amp; Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High &amp; Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High &amp; High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low &amp; Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low &amp; Low</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium &amp; Low</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>High &amp; High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- NKF’s assessment of each state’s capacity, capability, and probability of delivering incentives packages of a certain type and value are highly subjective and subject to change. Preliminary incentive discussion are based on many assumptions and in some cases, require legislative changes or politically-approved funding commitments.
5. OVERALL FINDINGS

Newmark
Knight Frank
The **10-year cash flows** from the Cost Analysis and the Incentives Feasibility Analysis were integrated into a unified cost model showing the costs (above the line) and cost offsets (below the line).
The **10-year cash flows** from the Cost Analysis and the Incentives Feasibility Analysis are also displayed in a cost model summary table (in millions).

<table>
<thead>
<tr>
<th>10 Year NPV</th>
<th>Batavia, NY</th>
<th>Clay, NY</th>
<th>Marcy, NY</th>
<th>Malta, NY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Capital Investment</strong></td>
<td>$11,271</td>
<td>$11,171</td>
<td>$11,143</td>
<td>$11,231</td>
</tr>
<tr>
<td><strong>Total Human Resources</strong></td>
<td>$1,142</td>
<td>$1,174</td>
<td>$1,130</td>
<td>$1,243</td>
</tr>
<tr>
<td><strong>Total Utilities</strong></td>
<td>$508</td>
<td>$521</td>
<td>$543</td>
<td>$551</td>
</tr>
<tr>
<td><strong>Total Taxes</strong></td>
<td>$1,028</td>
<td>$1,028</td>
<td>$1,028</td>
<td>$1,028</td>
</tr>
<tr>
<td><strong>Total Investments and Costs</strong></td>
<td>$13,948</td>
<td>$13,895</td>
<td>$13,845</td>
<td>$14,053</td>
</tr>
<tr>
<td><strong>Total Incentive Offset</strong></td>
<td>($1,317)</td>
<td>($1,329)</td>
<td>($1,445)</td>
<td>($1,419)</td>
</tr>
<tr>
<td><strong>Total Cost of Operations</strong></td>
<td>$12,631</td>
<td>$12,566</td>
<td>$12,399</td>
<td>$12,634</td>
</tr>
</tbody>
</table>
Overall Assessments:
Total Net Costs, including Incentives

- The **Total Net Costs** chart includes the incentives offsets and reduces the total one-time investment and recurring operating costs. This is the estimated cost of doing business including all incentives presented and assumed based on Project Rhino.
Overall Assessments: Cost and Quality – 2 x 2 Location Matrix

EXCLUDING Incentives Offsets

The “2x2 matrix” plots the quality of location against total costs (NPV) over the 10-year model period.
**Including Incentives Offsets**

- Location quality is not affected by the application of economic incentives savings.
- Cost reduction impacts of the incentives are clearly evident; dramatic for some locations and relatively negligible for others.
Overall Assessments:
Cost and Quality – Location Matrix

INCLUDING Incentives Offsets continued

The matrix below illustrates how location results improve when including incentive offsets.

Blue markers represent the location results prior to application of incentives benefits. Purple markers represent the location after applying incentives. Arrows illustrate the degree of improvement (reduced NPV).

10 Year NPV with Incentives ($ Billions)

Location Score

Preferred Quadrant
High Quality

Low Cost

Marcy, NY
Batavia, NY
Clay, NY
Malta, NY

$14.5
$14.0
$13.5
$13.0
$12.5
$12.0

$12.0
$13.0
$13.5
$14.0
$14.5
## Overall Assessments:
### NYS High-Level Site Summaries

### Batavia
**WNY Science & Tech Advanced Manufacturing Park**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Electricity costs</td>
<td>- Need for significant off-site investment in infrastructure and time to deliver</td>
</tr>
<tr>
<td>- Labor cost and availability (vs. other NY sites)</td>
<td></td>
</tr>
<tr>
<td>- Incentive capacity/capability</td>
<td></td>
</tr>
</tbody>
</table>

### Clay
**White Pine Park**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Relative ease of development</td>
<td>- Size and quality of local workforce and supporting trades</td>
</tr>
<tr>
<td>- Utility costs</td>
<td></td>
</tr>
<tr>
<td>- Incentive capacity/capability</td>
<td></td>
</tr>
</tbody>
</table>

### Marcy
**Nanocenter at SUNY Polytechnic Institute**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Development and infrastructure readiness</td>
<td>- Size and quality of local workforce and supporting trades</td>
</tr>
<tr>
<td>- Incentive capacity/capability</td>
<td></td>
</tr>
<tr>
<td>- Labor cost</td>
<td></td>
</tr>
</tbody>
</table>

### Malta
**Luther Forest Technology Center**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Utility costs (electric/natural gas)</td>
<td>- Site’s development readiness</td>
</tr>
<tr>
<td>- Incentive capacity/capability</td>
<td>- Misalignment of local ED entities</td>
</tr>
<tr>
<td>- Regional R&amp;D expertise</td>
<td>- Ability to supply accurate/timely info</td>
</tr>
<tr>
<td>- Site’s development readiness</td>
<td>- Local non-R&amp;D workforce size</td>
</tr>
</tbody>
</table>
**Overall Assessments:**

**Alternative Target Industry Uses and Opportunities**

NKF explored industry sectors that might have higher probabilities of success or produce economic results sooner than waiting for a semiconductor fab. NKF focused on sector NAICS codes that had one of four principle characteristics, being: (1) within or complementary to the semiconductor supply chain; (2) able to utilize the substantial utility capacities of the sites for manufacturing products with high embedded energy or water; (3) a growing industry, nationally, or (4) able to utilize the sizeable acreage on a permanent basis or a temporary basis until a higher-value industry alternative is identified.

Industry opportunities should be modified in degree for each site based on each location’s property and utility attributes, and in particular for STAMP and Malta where larger populations and workforces would support employers that have larger headcount requirements and high-skilled talent needs, in particular.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing and Hosting, i.e. Data Centers</td>
<td>Steel Product Manufacturing from Purchased Steel</td>
</tr>
<tr>
<td>Computer and Electronic Product Manufacturing, including semiconductor, electronics, navigational, electromedical, controls, optical media, etc.</td>
<td>Chemical Manufacturing (Basic Chemicals and Agricultural)</td>
</tr>
<tr>
<td>Electrical and Appliance Manufacturing</td>
<td>Plastics and Rubber Manufacturing</td>
</tr>
<tr>
<td>Food and Beverage Manufacturing, both human and animal</td>
<td>Personal Care &amp; Cleaning Product Manufacturing</td>
</tr>
<tr>
<td>Building Products Manufacturing, especially with glass, plastics, and composite materials</td>
<td>Pharmaceutical and Medicine Manufacturing</td>
</tr>
<tr>
<td>Power Transmission Equipment Manufacturing</td>
<td>Medical Equipment and Supplies Manufacturing</td>
</tr>
<tr>
<td>Architectural and Structural Metals Manufacturing</td>
<td>Rail and Truck Transportation</td>
</tr>
<tr>
<td>Heavy &amp; Civil Engineering Construction (especially with concrete &amp; steel and outside storage requirements)</td>
<td>Warehousing and Storage, especially Cold Storage</td>
</tr>
<tr>
<td>Specialty Materials Manufacturing</td>
<td>Waste Management, Recycling, and Remediation</td>
</tr>
</tbody>
</table>
Overall Assessments: The Researchable Problems Answered

Project Rhino was initiated to address three fundamental questions:

1. **Benchmark vs. Industry Needs:** How well do New York State’s semiconductor sites and communities satisfy the needs of the industry and are they ready to fulfill that investment objective?

2. **Benchmark vs. US Competitor Locations:** How well do New York State’s semiconductor sites and communities compete against the location quality and cost structure of US location alternatives?

3. **Alternative Uses:** Do the attributes of New York State’s semiconductor sites and communities suggest other sectors that may produce better or more likely economic development outcomes.

Based on NKF’s **Location**, **Cost**, and **Economic Incentives** assessments, the conclusions are clear:

- **Location:** Several sites in New York compete strongly based on the development readiness of their key sites. The size of the qualified talent pool to support a project of this magnitude is a concern in some communities. The 4-5 high quality options in competing states present formidable competition in terms of both the depth of their labor pools and their site readiness.

- **Cost:** New York is not inherently a low-cost leader except in the areas of electricity, natural gas, and the tax treatment of capital intensive operations. These are important differentiators. The capacity and cost of key utilities suggest other industry sectors that would also be valuable pursuits at these sites.

- **Incentives:** New York stands alone in its ability and preparedness to offer large economic incentives packages that can neutralize or overwhelm the advantage of lower investment and operating costs available in other jurisdictions. New York also stands apart in terms of its political support and regional alignment for the semiconductor industry, which remains a high-growth sector opportunity. A fraction of this incentives capacity would also be valuable to other sectors that were to locate at New York’s sites.
In addition to the specific quality and cost considerations inherent to New York State’s semiconductor sites and communities, NKF believes that other strategic considerations and industry issues will also be instrumental in the location decision-making of any future semiconductor fab investor. Many of these may be beyond the control of New York’s state, local, and utility economic development partners.

Other strategic and industry factors or considerations that may influence a site selection decision include:

- Long-run cost reduction opportunities within their supply chain
- Diversity of global and U.S. production capacity and supply chain
- Physical and political risk reduction achievable through geographic diversity
- Ongoing negotiating leverage with governments and suppliers in different geographies
- Greater internal (friendly) competition between “sister sites” of the same firm
- Heightened U.S. political influence with legislators from a selected state acting as advocates
- Density and concentration of Client employees in one location, which strengthens company culture but also potentially stifles diversity and innovation
- Customer and commercial market considerations
- Environmental considerations (air quality; greening the supply chain; etc.)
- Importance of research and development resources and capabilities in addition to production