

CITY COUNCIL AGENDA ITEM
CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	Motion to Approve the 2015 King County LiDAR Project Funding Interlocal Agreement		
DEPARTMENT:	Administrative Services		
PRESENTED BY:	Katie Moriarty, Information Technology Director		
ACTION:	<input type="checkbox"/> Ordinance	<input type="checkbox"/> Resolution	<input checked="" type="checkbox"/> Motion
	<input type="checkbox"/> Discussion	<input type="checkbox"/> Public Hearing	

PROBLEM/ISSUE STATEMENT:

In the aftermath of the Oso landslide, acquisition of a LiDAR dataset was sought to provide an inexpensive and proven method to identify and analyze historic landslides in the Pacific Northwest. The obtained LiDAR dataset will be used to analyze and detect historic landslides, provide a tool to help mitigate localized flooding, and provide an accurate, low cost method to measure elevations of the earth's surface, as well as its natural and manmade features (trees, buildings, and steep slopes).

To acquire LiDAR, local and regional governments have formed a consortium to share in the cost of data acquisition. The King County and Kitsap County Departments of Emergency Management have taken the lead to organize this cooperative effort. The funding agreement is between 30 governmental agencies and is detailed in Attachment A - King County LiDAR Project Funding Agreement. Council approval is required for the City of Shoreline's participation in the agreement.

RESOURCE/FINANCIAL IMPACT:

The 2016 Budget includes \$5,000 for this LiDAR acquisition. The primary advantage of this acquisition is cost sharing among the participating jurisdictions. The City would pay roughly \$20,000 to obtain LiDAR data independently, versus \$5,033 as part of this cooperative effort.

RECOMMENDATION

Staff recommends that Council move to approve the 2015 King County LiDAR Project Funding Agreement.

Approved By: City Manager **DT** City Attorney **MK**

BACKGROUND

In the aftermath of the Oso landslide, acquisition of a LiDAR dataset was sought to provide an inexpensive and proven method to identify and analyze historic landslides in the Pacific Northwest. LiDAR, a portmanteau of the words “light” and “radar”, is acquired using a laser pulse initiated from a low flying aircraft and provides a sort of measuring rod to determine the elevation of the ground, as well as manmade and natural objects, such as buildings and trees. LiDAR is particularly effective under tree canopy, in areas like Puget Sound bluffs, or for any other steep slope. In Shoreline and Pt. Wells, it will substantially improve the City’s ability to assess those areas that are most susceptible to future landslides, and potentially find previously unidentified and unstable slopes. However, its application reaches far beyond landslide detection.

This modern technology provides an inexpensive topographic map needed by municipalities like Shoreline to conduct essential workflows. Staff will use LiDAR to improve the accuracy of the City’s wetland, stream and steep slope mapping. It provides a tool to quickly obtain the height and location of a building, tree, bridge, or an area susceptible to localized flooding.

DISCUSSION

To acquire LiDAR, local governments have formed a consortium to share in the cost of data acquisition. The King County and Kitsap County Departments of Emergency Management have taken the lead to organize this cooperative effort. The funding agreement is between 30 governmental agencies and is detailed in Attachment A - King County LiDAR Project Funding Agreement. Council approval is required for the City of Shoreline’s participation in the agreement.

As part of the cooperative agreement through the Puget Sound LiDAR Consortium, the obtained data will be shared by multiple agencies at all levels of government, including King County, the State of Washington, and the Federal Emergency Management Agency (FEMA). As a local government effort, the Consortium’s LiDAR specification provides an accuracy and resolution to meet the requirements of municipal workflows for localized analysis and determinations.

Since regional LiDAR acquisitions occur every 10-20 years, a new cooperative acquisition would not become available for some time. This effort reduces the City’s costs compared to obtaining this data alone. Using traditional methods to map where a tree or building resides on a property could cost more than this entire proposed expenditure.

COUNCIL GOAL(S) ADDRESSED

The King County LiDAR Project supports Council Goal 2: Improve Shoreline’s utility, transportation and environmental infrastructure.

RESOURCE/FINANCIAL IMPACT

The 2016 Budget includes \$5,000 for this LiDAR acquisition. The primary advantage of this acquisition is cost sharing among the participating jurisdictions. The City would pay roughly \$20,000 to obtain LiDAR data independently, versus \$5,033 as part of this cooperative effort.

RECOMMENDATION

Staff recommends that Council move to approve the 2015 King County LiDAR Project Funding Agreement.

ATTACHMENTS

Attachment A: 2015 King County LiDAR Project Funding Agreement

2015 King County Lidar Project Funding Agreement

This Funding Agreement (Agreement) is entered into by and among: the City of Algona, the Town of Beaux Arts Village, the City of Burien, the City of Clyde Hill, the City of Des Moines, the City of Enumclaw, Highlands Sewer District, the Town of Hunts Point, the City of Kenmore, the King County Water District 111, the King County Water District 125, King County, the City of Lake Forest Park, the City of Medina, the City of Mercer Island, the City of Milton, the Muckleshoot Tribe, the City of Newcastle, the City of Normandy Park, the City of SeaTac, the Port of Seattle, the City of Shoreline, the Skyway Water and Sewer District, the City of Snoqualmie, the City of Tukwila, the Valley View Sewer District, the Vashon Sewer District, the City of Woodinville, the Town of Yarrow Point, and other cities and governmental service agencies that later join subject to Section VI of this Agreement (hereinafter “Party” or Parties”).

RECITALS

WHEREAS, the Parties to this Agreement consist of local governmental entities, including counties, cities, and governmental services agencies; and

WHEREAS, the purpose of this Agreement is to permit the Parties to cooperate on the funding of a 2015 Lidar Acquisition Project (Project); and

WHEREAS, the Project will provide 1) deliverables from Quantum Spatial, Inc. (QSI), the vendor Kitsap County Department of Emergency Management (KCDEM) entered a contract with for the acquisition and processing of high-resolution lidar data; and 2) quality assessment/assurance (QA) of the deliverables by the Puget Sound Lidar Consortium (PSLC); and

WHEREAS, KCDEM will provide among other things, administrative management of the Project; and

WHEREAS, agencies throughout the King County region regularly engage in joint operations and provide mutual assistance through effective interagency cooperation, and

WHEREAS, jointly funding the Project will optimize the agencies’ powers and resources, and ensure a standardized product for all Parties; and

WHEREAS, this Agreement will provide substantial benefit to the citizens of the participating governmental agencies;

NOW THEREFORE, it is hereby agreed and covenanted among the undersigned as follows:

I. PROJECT DESCRIPTION

Project details, technical specifications, and deliverable descriptions appear in the Lidar Data Acquisition Cost Schedule developed by QSI, found in Exhibit A. All deliverables will match the best-of-breed data specification as defined for the Puget Sound Lidar Consortium. The area of interest (AOI) for this project includes approximately 1,095 square miles of the western portion of King County and portions of adjacent counties to capture the AOIs for the cities of Auburn, Bothell, Milton, Shoreline, and Woodinville. The Project data will be acquired beginning in October 2015 for the upper elevations and in November/December for the lower elevations during the early leaf-off period of 2015. Delivery of data and products by QSI to the PSLC QA team will be within sixty (60) calendar days of the last date of acquisition for the Project. QA review will be completed within thirty (30) business days of delivery from QSI. Project costs are shared subject to Section V of this Agreement reducing each Party's financial commitment.

II. PROJECT MANAGEMENT

1. KCDEM will manage all components of the Project, including but not limited to contract administration and coordination with QSI and the PSLC. King County shall enter into a separate Interlocal Agreement (ILA) with KCDEM and appoint a Project Manager (KC PM) to coordinate with KCDEM. The KC PM shall report to the Parties on the matters described in Section III.2 below, and shall be readily accessible via phone and e-mail by all Parties. The KC PM shall remain an employee of King County at all times, and King County shall retain the right and duty to supervise the KC PM at all times.
2. The duties of the KC PM shall include:
 - a. Prepare a cost-allocation model and populate the model with required data to provide each Party with an accurate, final cost.
 - b. Provide direction and guidance to KCDEM, as requested by the Parties.
 - c. Report to the Parties on the Project's progress.
 - d. Account for availability and completeness of all Parties deliverables.
 - e. Validate and approve invoices submitted from KCDEM and direct payment to the applicable Party.

III. PROJECT COMMITTEE

1. A Project Committee (Committee) shall be formed and shall consist of one representative from each Party that is a signatory to this Agreement. The KC PM will provide coordination among the Committee and KCDEM. The KC PM will serve as the Chair of the Committee.
2. The Committee shall review and take action on the following specific items:
 - a. Review Project reports submitted by KCDEM, QSI, and the PSLC.

- b. Evaluate and provide direction to KCDEM regarding change order requests whether initiated by QSI or by a member or members of the Committee.
- 3. Meetings of the Committee shall be held on an as-needed basis. Meetings may be scheduled at the request of the KC PM, or by one of the members of the Committee. The KC PM shall be responsible for the logistics of scheduling meetings. Attendance may be in person or via teleconferencing.

IV. FISCAL AGENT

- 1. King County, acting as Fiscal Agent for the Project, shall:
 - a. Enter into an ILA with KCDEM.
 - b. Validate the cost for each Party.
 - c. Invoice each Party in accordance with this Agreement.
 - d. Maintain Project funds in the King County Imagery Reserve, a separate, non-interest-bearing fund managed by the King County GIS Center, to be disbursed as provided in this Agreement.
 - e. Pay invoices submitted by the PM from KCDEM.
 - f. Refund excess funds, if necessary and if greater than \$10.00.
- 2. King County shall perform and maintain an accounting of payments received from all Parties including: billings received, payments made, and unspent funds. King County shall provide a statement of this accounting to all Parties upon written (including e-mail) request.
- 3. Upon receipt of a notice of any record keeping dispute, King County shall notify all Parties and meet jointly with all interested Parties within two (2) weeks to resolve any record keeping dispute.

V. CONTRIBUTIONS BY PARTIES

- 1. By executing Counterparts, Section XVI of this Agreement, each Party agrees to pay its required monetary contribution, as stated on the signature page, for Project deliverables, KCDEM project management and QA services, for its AOI.
- 2. The contribution by each Party shall be calculated using the cost allocation model as set forth here.
 - a. The square miles of the corporate or otherwise defined AOI times 1.5, defined to two decimal point precision.
 - b. Value from (a) above, multiplied by the unit cost (cost per sq. mile) of the standard deliverables (\$569.09) and multiplied by 0.5. The unit cost for the standard deliverables includes a 7% surcharge for KCDEM Project

Management and a 7% surcharge for PSLC QA Services. This is the final cost for the Party.

3. **Optional deliverables are not included in the initial project proposal**, but may be negotiated and included later, executed under a separate counterpart, and paid at a mutually agreed date.
4. By signing this Agreement, each Party commits to paying its full contribution to the King County Imagery Reserve Fund by January 31, 2016. A Party may contribute its share from its budget from either FY 2015 or FY 2016.
5. All payments to the King County Imagery Reserve Fund shall be made by check payable to: **King County Finance**, and sent to **King County GIS Center, 201 South Jackson Street, Suite 706, Seattle, WA 98104, Attn: Katy Cressey**.
6. All funds collected by King County shall be used solely to pay all responsible Parties for work accepted under the QSI contract. King County shall not collect, receive or retain any of these funds for project management, administrative fees, or other actions it performs under this Agreement.

VI. ADDITION OF PARTIES

1. An entity may be added to this Agreement as long as the entity signs this Agreement and its AOI is wholly included within the project boundary defined in Exhibit A.
2. A Party added to this Agreement shall make full payment to the King County Imagery Reserve Fund by January 31, 2016. A Party may contribute its share from its budget for either FY 2015 or FY 2016.

VII. INDEPENDENT CONTRACTOR

The services provided by King County under this Agreement are those of an independent contractor. Employees of King County are and will remain employees of King County. Employees of the other Parties are and will remain employees of their respective Parties. Nothing in this Agreement shall be construed to render the Parties partners or joint venturers.

VIII. INDEMNIFICATION

Each Party shall defend, protect and hold harmless the other Parties from and against all claims, suits and/or other actions arising from any negligent or intentional act or omission of that Party's employees, agents and/or authorized subcontractor(s) while performing this Agreement.

IX. AMENDMENT

The Parties may amend this Agreement. Such amendments shall not be binding unless in writing and signed by personnel authorized to bind each of the Parties.

X. CHOICE OF LAW AND VENUE

This Agreement shall be governed by the laws of the State of Washington, both as to interpretation and performance. Any action at law, suit in equity or other judicial proceeding for the enforcement of this Agreement shall be instituted only in a court of competent jurisdiction in King County.

XI. INTEGRATION CLAUSE

This instrument embodies the entire agreement of the Parties with respect to funding of the contract. There are no promises, terms, conditions or obligations other than those contained in this Agreement. This Agreement supersedes all previous communications, representations or agreements, either oral or written, between any Party and King County.

XII. TERMINATION CLAUSE

In the event that King County decides not to enter into an ILA with KCDEM, this Agreement will terminate and all Parties will receive a full refund of their contributed funds.

XIII. NO ASSIGNMENT

The Parties shall not subcontract, assign, or delegate any of their rights, duties or obligations under this Agreement without the express prior written approval of King County.

XIV. DISPUTES

In the event that a dispute arises under this Agreement, the Parties shall endeavor to resolve the dispute in an amicable manner by direct discussions. If not resolved by mutual agreement, then the Parties may engage in alternative dispute resolution by mutual agreement. No party waives its rights to seek legal remedy in the jurisdiction and venue stated in Section X.

XV. EFFECTIVE DATE; TERM

Notwithstanding when this Agreement is signed, this Agreement shall take effect following its execution by each Party and shall expire at the end of 2016 unless terminated sooner.

XVI. COUNTERPARTS

Comment: Each Party will be provided with its unique COUNTERPARTS page. Besides the signature block this page will contain:

- a. Cost generated by the cost allocation model for standard deliverables and optional deliverables.*
- b. Specific terms of payment for those Parties with requirements for meeting its financial contribution in a different manner than stated in the main body of the Agreement.*

1.Name of Party	2.AOI times 1.5	3. Unit Cost for standard deliverables	4. Cost for standard deliverables	5. Cost for optional deliverables
City of Shoreline	17.69 sq. mi.	\$569.09	\$5,033.19	<Enter the cost of optional deliverables such as contours, etc.>

This Agreement may be signed in several counterparts, each of which shall be an original, but all of which together shall constitute the same instrument.

King County Lidar Project – Party Agreement Acceptance

(**Note:** Executing this section commits Party to acceptance and conditions within this Agreement.)

Party Organization

Party Address

Party Signature

Date

Party Print Name

Party Title

Optional – Approved as to Form Only

(**Note:** this section is optional and is provided for each Party should the Party require it. Completion of this section is NOT necessary for the purposes of formally committing to this Agreement. It is provided for those entities needing the Agreement to contain relevant internal approval process tracking information.)

Approval Organization

Approval Address

Approval Signature

Date

Approval Print Name

Approval Title

Optional – King County Agreement Acceptance

(**Note:** this section is optional and is provided for each Party should the Party require a counter signature to this agreement by King County. Completion of this section is NOT necessary for the purposes of formally committing to this agreement.)

King County Department

King County Address

King County Signature

Date

Print Name

Title

Exhibit A

LiDAR Data Acquisition Cost Proposal – King County LiDAR Project

September 9, 2015

Michael Gordon

Kitsap County Department of Emergency Management

911 Carver St

Bremerton, WA 98312

360-307-5872

mgordon@co.kitsap.wa.us

RE: LiDAR Data Acquisition Cost Proposal – King County 2015 Project Area, WA

Quantum Spatial, Inc. appreciates the opportunity to present to the **Puget Sound LiDAR Consortium (PSLC)** a cost proposal for acquiring and processing high-resolution (> 8 pulses/m²) LiDAR data for the project area of interest to King County, WA. Our cost for LiDAR acquisition and processing abides by our negotiated cost structure with the PSLC, assuming that a contract for standard deliverables will be administered through Kitsap County, WA.

LiDAR point cloud colored by NAIP imagery of downtown Redmond, Washington.



Services

Airborne LiDAR

QSI will collect LiDAR data using a Leica LiDAR system to produce a highly accurate, high resolution (≥ 8 pulses/m²) LiDAR dataset with no gaps and ample buffers (at least 100m) around project boundaries. Data will be collected at a $\leq 30^\circ$ field of view ($\pm 15^\circ$ from nadir), with at least 50% overlap among swaths to minimize gaps and laser shadowing. The LiDAR system records up to four range measurements (returns) per pulse (first, second, third, and last). All overlapping flight lines will be flown in opposing directions to maximize detection of swath to swath inconsistencies used to resolve system misalignments. Our GPS receivers and LiDAR systems are GNSS-capable ensuring low PDOP values and adequate satellite constellations throughout the mission. GPS quality is predicted before the flight and checked during post processing to ensure that positional accuracy exceeds specifications.

Using a combination of automated and manual techniques that are tailored to the particular land cover and terrain of the study area, LiDAR processing will include kinematic corrections, calculation of laser point position, relative accuracy testing and calibrations, classification of ground and non-ground points, assessments of statistical absolute accuracy, and creation of ground surface models.

Absolute accuracy assessments will compare known RTK ground survey points to derived LiDAR points. Accuracies

LiDAR Specifications Summary	
Multi-Swath Pulse Density	≥ 8 pulses/m ²
Scan Angle	$\leq 30^\circ$ (+/-15° from Nadir)
Returns Collected Per Laser Pulse	Up to 4
Intensity Range	1-255
Swath Overlap	50% side-lap (100% overlap)
GPS PDOP During Acquisition	≤ 3.0
GPS Satellite Constellation	≥ 6
Maximum GPS Baseline	13 nautical miles
Accuracy _z (1.96 σ), slope <20°	≤ 20 cm
Vertical Accuracy (σ), slope <20°	≤ 15 cm
Horizontal Accuracy (σ)	≤ 30 cm

are described as the mean and standard deviation (σ) of divergence from RTK ground survey point coordinates. All accuracy statistics (RMSE_z, Accuracy_z - 1.96 σ , skewness/distribution, and percentile deviations) will be reported in the final report. Statements of statistical accuracy will apply to fixed terrestrial surfaces only.

Survey Control

Simultaneous to the LiDAR data collection mission, QSI will conduct a static (1 Hz recording frequency) survey of the horizontal and vertical positions of two or more survey control dual-frequency DGPS base stations established at monuments with known coordinates. Maximum baseline lengths between control points and the aircraft GPS do not exceed 24 kilometers (13 nautical miles). After the static GPS data have been collected, the files will be processed using the Online Positioning User Service (OPUS). Multiple sessions will be processed over the same monument to confirm antenna height measurements and reported OPUS position accuracy. Control monument locations will be certified by a QSI Washington PLS.

Quality control real-time kinematic (RTK) ground check survey data will be collected within the project area, with an established Root Mean Square Error (RMSE) of less than 2 cm. Absolute laser spot accuracies will be statistically analyzed based upon an adequate sample (500 per 50,000 acres, depending on access and GPS conditions within study area) of well-distributed RTK ground survey points on open, bare earth surfaces with level slope.



Deliverables

Deliverables will match standard for Puget Sound LiDAR Consortium:

LiDAR	
Report of Survey	Text report that describes survey methods; results; vendor's accuracy assessments, including internal consistency and absolute accuracy; and metadata <i>.pdf, .doc, or .odt format</i>
Aircraft trajectories (SBET files)	Aircraft position (easting, northing, elevation) and attitude (heading, pitch, roll) and GPS time recorded at regular intervals of 1 second or less. May include additional attributes. <i>ASCII text format</i>
All-return point cloud	List of all valid returns. For each return: GPS week, GPS second, easting, northing, elevation, intensity, return#, return classification. May include additional attributes. No duplicate entries. <i>ASCII text and LAS version 1.2 format</i> <i>1/100th USGS 7.5-minute quadrangle (0.75 minute by 0.75 minute) tiles</i>
Ground point list	List of X,Y,Z coordinates of all identified ground points. <i>ASCII text.</i> <i>1/100th USGS 7.5-minute quadrangle (0.75 minute by 0.75 minute) tiles</i>
Ground surface model	Raster of ground surface, interpolated via triangulated irregular network from identified ground points. No unavoidable point misclassification <i>ESRI floating point grid, 3 ft cell size, snapped to (0,0), 1/4th USGS 7.5-minute quadrangle (3.75 minute by 3.75 minute) tiles</i>
First-return (highest-hit) surface model	Raster of first-return surface, cell heights are highest recorded value within that cell, voids may be filled with ground surface model <i>ESRI floating point grid, 3 ft cell size, snapped to (0,0), 1/4th USGS 7.5-minute quadrangle (3.75 minute by 3.75 minute) tiles</i>
Intensity image	<i>GeoTIFF, 1.5. ft pixel size, 1/4th USGS 7.5-minute quadrangle (3.75 minute by 3.75 minute) tiles</i>
<i>Files shall conform to a consistent naming scheme. Files shall have consistent internal formats. Surface models shall have no tiling artifacts and no gaps at tile boundaries. Areas outside survey boundary shall be coded as NoData. Internal voids (e.g., open water areas, shadowed areas in first-return surface) may be coded as NoData.</i>	

Coordinate System*	
Projection	Washington State Plane North
Horizontal Datum	NAD83 (CORS96)
Vertical Datum	NAVD88 (GEOID03)
Units	U.S. Survey Feet
Delineations	USGS Quadrangle tiling scheme
<i>*To match with existing data. The data will be created in NAD83 (CORS96), but for GIS purposes will be defined as NAD83 (HARN).</i>	

Area of Interest – King County, WA

The area of interest (AOI) for this cost proposal includes 700,329 acres spread through King County, WA (Figure 1). Previous LiDAR collections for the PSLC and Pierce County are shown in grey. Overlap between collections will facilitate data matching. The AOI will be buffered by 100 meters to ensure complete coverage and adequate point densities around study area boundaries.

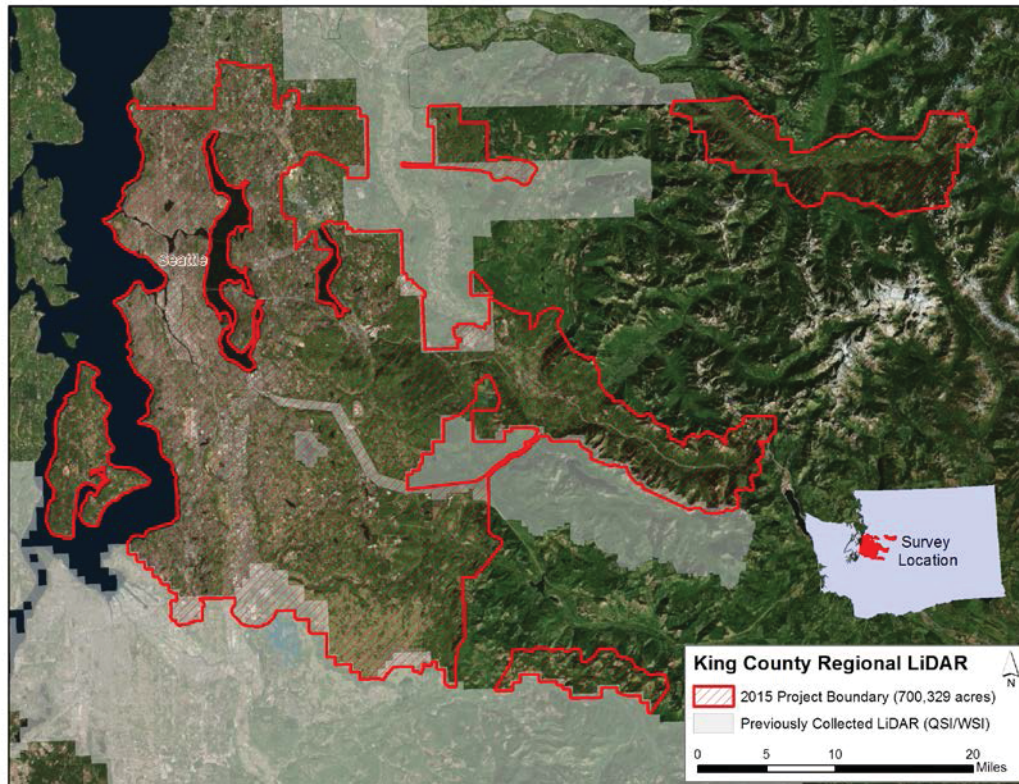


Figure 1. Area of interest for LiDAR acquisition in King County, WA.

Schedule

QSI will work with PSLC and King County to coordinate timing of data collection during fall 2015 as best meets the needs of the project. All data are delivered to PSLC within 60 days of acquisition.

Cost Proposal

The following table presents LiDAR acquisition and processing costs for the project area portrayed in Figure 1, assuming above specifications and deliverables. Costs for acquisition and base level processing are in accordance with QSI's negotiated area-weighted rate structure with the Puget Sound LiDAR Consortium.

King County, WA Regional LiDAR 2015 (700,329 acres)	Total Cost	Per Acre Cost
LiDAR Acquisition and Base Processing	\$546,256.62	\$0.78

* Budget does not include 14% PSLC administrative fee.