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December 11, 2020

Mr. Clarence T. Daugherty, P.E.
County Engineer
Collin County
4690 Community Ave., Suite 200
McKinney, TX 75071

RE: Frontier Parkway Engineering Services Agreement
Collin County Contract No. 2016-229
Collin County Purchase Order No. 199212
Amendment No. 10

Dear Mr. Daugherty:

As you requested, we are pleased to submit Amendment No. 10 to our Engineering Services Agreement with Collin County dated Sept. 27, 2016 (Collin County Purchase Order No. 199212) for the design of Frontier Parkway, from the Dallas North Tollway (DNT) to S.H. 289 (Collin County Contract No. 2016-229).

This Amendment No. 10 makes the following changes to the scope and fee in the original agreement.

NEW SCOPE ITEM:

C.6a Project Visualization (By RDV System, Inc.) and Technical Support – Final Design Only

At the request of Collin County and the project stakeholders, prepare and provide a computer-generated interactive 3D model and flyover video showing the project roadway design superimposed on surrounding existing conditions. To accomplish this new scope and deliverable, and at the request of the Town of Prosper, Birkhoff, Hendricks & Carter, LLP (BHC) will use the services of the sub-consultant RDV Systems, Inc. of Manchester New Hampshire.

The project scope, deliverables and BHC's expected technical support are specifically outlined in the proposal from RDV Systems, Inc. to BHC dated December 4, 2020 attached hereto as **"Exhibit A"**

BHC will coordinate the Project Visualization effort and provide technical support and design files as outlined in Exhibit A to RDV Systems for their efforts to produce a computer-generated video of the final design layout of Frontier Parkway.

C.6b Project Visualization (By RDV System, Inc.) and Technical Support – Construction Phases

If authorized by Collin County under this Amendment No. 10, BHC through their sub-consultant RDV Systems, Inc. will provide a computer-generated interactive model and flyover video showing the various construction phases for the Frontier Parkway Project. Four (4) main phases of construction will be visualized.

The project scope, deliverables and BHC's expected technical support are specifically outlined in the proposal from RDV Systems, Inc. to BHC dated December 4, 2020 attached hereto as **"Exhibit A"**

PROJECT SCHEDULE

The scope of services and deliverables included in this Amendment No. 10 are expected to be completed and delivered within six (6) weeks of authorization to proceed.

CHANGE IN FEE

For the sub-consultant services outlined in Exhibit A, BHC will bill at the actual invoice amount presented by RDV Systems, Inc. in amounts not to exceed the fee schedule therein for Phase 1 and if authorized, Phase 2

For BHC's technical support and coordination, we propose to be compensated based on actual salary cost times a multiplier of 2.4, with expenses (other than RVD Systems, Inc. invoices) billed at actual invoice amount times a multiplier of 1.15.

On this basis, we propose the Amendment No. 10 service fee not to exceed the following amounts:

C.6a – Project Visualization – Final Design Only:	\$28,750
C.6b – Project Visualization – Construction Phases:	<u>\$14,100</u>
Total Not to Exceed Amount, ESA Amendment No. 10:	\$42,850

The fee schedule is hereby modified by the amounts shown under the column heading "Amendment No. 10" on the "**Exhibit C – Fee Schedule**" below:

SEE NEXT PAGE

Exhibit “C”
Engineering Service Fee Schedule – Amendment No. 10

Engineering Service Agreement Phase			Contract Amounts (\$)		
			Contract Amount Through Amendment No. 9	Amendment No. 10	Revised Contract Amount, this Amendment
A. Basic Services Parts I-III (Lump Sum)	Part I. A.	Schematic Design	\$165,000		\$165,000
	Part I.B.	Final Design	\$1,279,340		\$1,279,340
	Part I.C.	Full Bridge Width Design with Alternate Bid for 4-lane Bridge	\$120,700		\$120,700
	Part I.D.	PISD Detention Pond Design	\$25,992		\$25,992
	Part I.E.	Prairie Crossing Road Design Phase	\$97,360		\$97,360
	Part I.E.a.	Prairie Crossing Road Bid Phase	\$0		\$0
	Part I.E.b.	Prairie Crossing Road Construction Phase	\$0		\$0
	Part I.F.	Traffic Signal Design at DNT and Preston Road	\$30,000		\$30,000
	Part II	Bidding Phase	\$31,750		\$31,750
	Part III.	Construction Administration	\$214,750		\$214,750
	Subtotal - Basic Services (Part A)		\$1,964,892	\$0	\$1,964,892
B. Additional Services (Hourly)	1	Field Surveys (Design, Property and Construction Support):	\$60,840		\$60,840
	2	R-O-W Map, Plats and Field Notes Descriptions (16 each):	\$78,519		\$78,519
	3	Geotechnical Investigation and Report:	\$75,326		\$75,326
	4	Flood Study:	\$28,120		\$28,120
	5	NCTCOG Environmental Form:	\$27,700		\$27,700
	6	404 Permit Application (Nationwide Permit 14):	\$38,751		\$38,751
	7	Permits (TxDOT, BNSF) and Utility Relocation Coordination:	\$69,500		\$69,500
	8	Asbestos Evaluation (4 Buildings):	\$2,215		\$2,215
	9	Project Stakeholder Design Meetings	\$50,176		\$50,176
	10	Attend Twenty(20) Additional Progress Meetings:	\$21,000		\$21,000
	11	Additional Printing of Construction Plans and Specifications:	\$5,000		\$5,000
	12	Revised Schematic Layouts, Drainage Evaluations, Cost Estimates and Coordination Meetings	\$20,870		\$20,870
	13a.	Doe Branch Tributary C Hydraulic Evaluations and Report	\$30,859		\$30,859
	13b.	Revised Flood Study for Detention Pond Design	\$8,636		\$8,636
	14	PISD Detention Pond Replat	\$15,000		\$15,000
	15	Level A Sub-Surface Utility Locates	\$4,100		\$4,100
	Subtotal Additional Services (Part B)		\$536,612	\$0	\$536,612

(Continued on next page)

Exhibit “C”
Engineering Service Fee Schedule – Amendment No.10 (Continued)

Engineering Service Agreement Phase			Contract Amounts (\$)		
			Contract Amount Through Amendment No. 9	Amendment No. 10	Revised Contract Amount, this Amendment
C. Optional Services (Hourly)	1	Traffic Signal Warrant Study	\$0		\$0
	2	Street Lighting Design	\$16,000		\$16,000
	3	Full Irrigation Design Plans and Specifications	\$0		\$0
	3a	Irrigation and Lighting Conduit Sleeves Only	\$5,000		\$5,000
	4	Sidewalks and Barrier Free Ramps (TDLR \$2,085 fee Included)	\$23,500		\$23,500
	5	On-site Observation of Construction Activity	\$0		\$0
	6a	Project Visualization - Final Design Only	\$0	\$28,750	\$28,750
	6b	Prject Visualization - Construction Phases	\$0	\$14,100	\$14,100
	Subtotal Optional Services (Part C)		\$44,500	\$42,850	\$87,350
Engineering Services Agreement Grand Total:			\$2,546,004	\$42,850	\$2,588,854

If this Amendment No. 10 to our original agreement dated September 27, 2016 meets with your approval, please have one set executed for Collin County and returned to our office. We look forward to our continued work on this project with you and your staff.

Sincerely,

Gary C. Hendricks, P.E., R.P.L.S.

APPROVED BY COLLIN COUNTY, TEXAS

By: _____

Date: _____

ATTACHMENT: Exhibit A – RDV Systems, Inc. Proposal

EXHIBIT A

RDV Systems, Inc. Proposal
December 4, 2020

(Ten Pages Total)

RDV Systems, Inc.
Proposal for Visualization Services

Proposal #205533 – Frontier Parkway Improvements

December 4, 2020

For: Birkhoff, Hendricks & Carter, L.L.P
11910 Greenville Ave., Suite 600
Dallas, TX 75243
Attn: Gary Hendricks
cc: Hulon Webb

By: RDV Systems, Inc.
289 Currier Drive
Manchester, NH 03104

Summary

Collin County, Texas (“Collin County”) has engaged engineering consultant Birkhoff, Hendricks & Carter L.L.P of Dallas, TX (“BHC”) to provide engineering design services for road widenings and improvements on Frontier Parkway. The project will widen approximately two miles of the existing road from two undivided lanes to four lanes with raised medians, add turn lanes at intersections, and replace a railroad crossing with a grade separation.

BHC’s scope of work includes public involvement activities and the preparation of visualizations and animations, and they have determined that an interactive 3D virtual project model and a flyover video showing the proposed designs superimposed on the surrounding existing conditions will facilitate these efforts. RDV Systems, Inc. of Manchester NH (“RDV”) is pleased to provide this Proposal for Visualization Services.

Summary of Software and Modeling Services

1. **Software and Subscriptions:** RDV will provide a Gold level subscription to RDV’s 123BIM.com cloud collaboration service for a period of six months to enable project team members to utilize the 3D project model and RDV software applications.
2. **Model Development Services:** RDV will prepare and deliver an interactive, three-dimensional interactive virtual model (“the 3D model”) showing the existing conditions and proposed design of the projects using RDV’s proprietary visualization technologies based on the Scope of Work described below. The 3D model will be developed and delivered in two phases:
Phase 1 - modeling of existing and proposed conditions (Tasks 1 through 4);
Phase 2 - modeling of construction staging (Task 5).
3. **Video Development Services:** RDV will utilize the 3D model to produce a flyover video showing the existing and proposed conditions (Phase 1), and another annotated video showing the construction staging plan (Phase 2).

Area of Modeling

The project model will include three-dimensional modeling for the approximate region shown as the “Area of Modeling” in Figure 1. The model will also include two-dimensional aerial photography without three-dimensional surface features for an extended area beyond the Area of Modeling to provide a wider contextual environment.

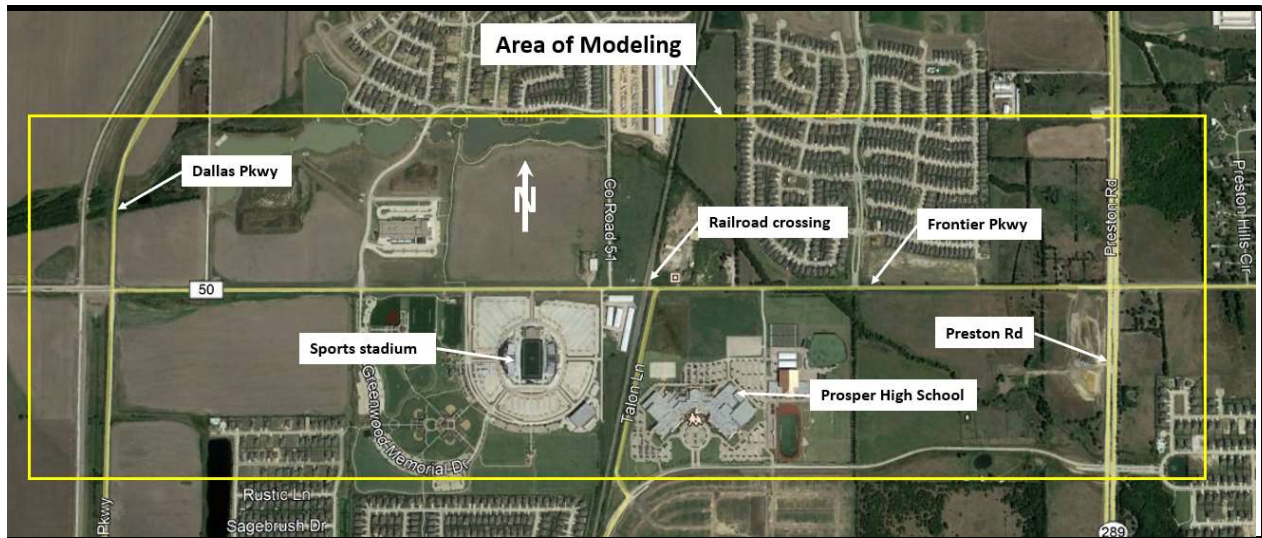


Figure 1 –Approximate Area of Modeling

Sources of Data and Information

BHC will provide RDV with all data and information needed to develop the 3D project model including, but not limited to, the following items:

- Ortho-rectified aerial photography with a minimum resolution of six inches-per-pixel of an extended region encompassing the Area of Modeling in industry standard image formats such as ECW, TIF, or MrSID;
- 3D topographic data and 3D surface models in TIN and/or contour formats for the existing conditions within the Area of Modeling in Autodesk Civil 3D format;
- Geometric information defining footprints of the existing buildings within the Area of Modeling in DWG, DGN, or SHP format, if available;
- Design data in project state-plane coordinates in Autodesk Civil 3D formats for the proposed improvements including geometric layout, profiles, typical sections, 3D corridor models, striping and marking plans, signal locations, details on the placement of curbs, sidewalks, medians, islands, bridge details, and other relevant corridor features;
- Geometric layout of proposed right-of-way lines and of boundaries of parcels adjacent to the project roadways in Autodesk Civil 3D format;
- Ground level photography of the existing Prosper High School campus buildings and sports stadium;
- Designation of existing buildings to be demolished for the corridor improvements;
- Maps or CAD drawings showing the street layouts of new subdivisions with the Area of Modeling that are not shown on aerial photographs;
- Design data in Autodesk DWG format showing the geometric layouts of the proposed construction staging and maintenance-of-traffic plans (Phase 2).

Software and Subscriptions

RDV will provide a subscription to RDV's 123BIM.com cloud collaboration service for a period of six months to enable project team members to utilize the 3D project model and RDV software applications. The 3D project model and associated software and subscriptions will provide BHC and Collin County with the ability to:

- View, analyze, and present the project in a web-hosted interactive environment;
- View, analyze, and present the project in an offline desktop interactive environment;
- Toggle between view states to compare existing conditions and design alternatives;
- Present any number of viewpoints and animation paths;
- Engage in collaboration meetings with remote project team members and stakeholders with shared access to the 3D model in a web-hosted environment;
- Create a web-hosted Virtual Tour making the interactive model accessible to stakeholders using computers, smart phones, and tablets;
- Export an unlimited number of still images from any vantage point at different sizes and resolutions;
- Export an unlimited number of video clips from static viewpoints and along animation paths;
- Export the 3D model to industry standard formats such as DAE and Unity for use with other visualization applications.

The RDV applications for accessing and utilizing the 3D model require an active subscription to RDV's 123BIM web collaboration service. The subscription period may be extended or re-activated as needed as per RDV standard pricing and terms in effect at the time of renewal.

A permanent copy of the 3D model can be retained by exporting the model to the DAE and/or Unity formats. All image and video files exported from the 3D model remain the property of Collin County and BHC.

System Requirements

123BIM.COM

The web-hosted 123BIM.com application for viewing and navigating 3D project visualization models and creating images, videos, and a virtual tour can be used by project team members on any Windows computer with an internet connection and graphics display capabilities. No software installation is needed.

123BIM Virtual Tour

The web-hosted virtual tours for interactively viewing the 3D project visualization models can be used on any Windows computer with an internet connection and graphics display capabilities, and on internet-connected smart phones and tablets. No software installation is needed.

123BIM Navigator

The optional 123BIM Navigator desktop application can be used by project team members and has the minimum and recommended system requirements shown below. It is the responsibility of project team members to utilize computers that comply with these requirements. 123BIM Navigator does not require an internet connection to operate.

	Minimum	Recommended
CPU	Intel(R) Core(™) i7-3612QM CPU @ 2.10 GHz or equivalent	Intel(R) Core(™) i7-3612QM CPU @ 2.10 GHz (8 CPUS) AMD Phenom II X6 1035T @ 2.60 GHz
RAM	8 GB	16 GB
OS	Windows 7 64-Bit, Windows 8 64-Bit, Windows 8.1 64-Bit, Windows 10 64-Bit	Windows 10 64-Bit
Disk	500 GB or more	500 GB or more
Video	AMD Radeon HD 5870 (1GB) or equivalent	NVIDIA GeForce GTX 770 AMD Radeon HD 7970

Scope of Work

Using RDV technology, RDV will develop and deliver a 3D project model that shows the project design superimposed on the surrounding existing conditions within the Area of Modeling, similar in quality and level of detail to the Figures shown below. Model development services will be based on the tasks described below.

Task 1 - Modeling of Existing Conditions (Phase 1)

The 3D project models will depict the existing conditions within the Area of Modeling by draping aerial photographs onto 3D terrain surface models and simulating selected surface features. Modeling of existing conditions within the Area of Modeling will include:

- Aerial photography draped onto the terrain surface models developed from the topographic data provided by BHC;
- Removal of “flattened” vehicles shown on aerial photography from the existing corridor;
- Realistic representation of the Prosper High School campus and sports stadium;
- Simplified and approximate representation of the remaining existing buildings located within the Area of Modeling consisting of building footprints extruded to form shapes with generic facades and roofs;
- Highlighting of existing buildings to be demolished;
- Conceptual representation of new subdivisions currently under construction;
- 3D representation of the Burlington Northern Railroad line and at-grade crossing;
- Approximation of the existing trees and foliage within the Area of Modeling based on visual inspection of aerial and street-level photography, similar in quality and appearance to those shown in the examples below.;
- Floating “billboard” labels identifying points of interest such as landmarks and intersections.

Except as listed above, the 3D project model will not include any other existing topographic features such as existing signs, signals, utility poles and cables, curbs, islands, lights, barriers, railings, or mailboxes.



Figure 2 - Example of Simplified 3D Representation of Existing Roadways, Buildings, and Foliage



Figure 3 - Example of Realistic Representation of Buildings



Figure 4 - Example of Representation of Existing At-Grade Railroad Crossing

Task 2 - Modeling of Proposed Design (Phase 1)

The 3D project model will show the proposed design of the Frontier Parkway improvements, similar in quality and level of detail to the examples shown in the Figures below, including

- Detailed three-dimensional representation of the proposed corridor improvements including travel lanes, shoulders, curbs, gutters, sidewalks, islands, intersection details with signs and signals, and pavement striping and markings;
- Detailed three-dimensional representation of the proposed railroad crossing overpass;
- Removal of buildings to be demolished for the corridor improvements;
- Overlay of proposed right-of-way lines and property boundaries;
- Stationary vehicles in appropriate locations.



Figure 5 - Example of Detailed 3D Modeling of Road Improvements



Figure 6 - Example of 3D Representation of Signalized Intersection



Figure 7 - Example of 3D Representation of Railroad Grade Separation



Figure 8 - Example of 3D Representation of ROW Lines and Property Boundaries

Task 3 - Flyover Video and Virtual Tour (Phase 1)

RDV will utilize the 3D project model to provide the following visualization assets:

- A flyover video that compares the existing and proposed conditions for the project, similar to the example that can be seen at https://www.youtube.com/watch?v=E9_oWKgrq4M;
- A web-hosted Virtual Tour providing the public or other selected stakeholders with access to the 3D project model in a simplified interactive environment, similar to the example that can be explored at <https://vtour.123bim.com/AAIK>.

Task 4 – Other / Miscellaneous Services (Phase 1)

In addition to the model development services, RDV will provide the following services with the delivery of the model:

- Pre-defined view states to enable toggling between existing and proposed conditions, intersection design alternatives, and right-of-way line overlays. BHC can create additional view states using the 123BIM applications;
- Shortcuts to pre-defined viewpoints. BHC can create additional viewpoint shortcuts using the 123BIM applications;
- Pre-defined animation paths to show drive-through and/or flyover views of the 3D project model. BHC can create additional animation paths using the 123BIM applications;
- Two hours of introductory training via web meeting to project team members on the use of the various 123BIM applications and the creation of visualization assets such as images, videos, and virtual tour;
- One hour of assistance via web meeting for optimal use of the 3D project model for specific public and stakeholder outreach events;

PDH certificates will be provided on request for the introductory training.

Task 5 - Modeling of Construction Staging (Phase 2)

After delivery of the Phase 1 3D model, BHC and Collin County may choose to add three-dimensional modeling of the construction staging and maintenance-of-traffic plan for the railroad grade separation, including:

- Three-dimensional modeling of up to three construction stage layouts showing detouring with appropriate traffic control features such as signs, barrels, and barriers, similar to the example shown in Figure 9;
- Conceptual representation of the railroad overpass bridge under construction at each stage;
- Production of an annotated video for educating the public on the maintenance-of-traffic plan, similar to the example that can be seen at <https://www.mass.gov/north-washington-street-bridge-replacement>.



Figure 9 - Example of 3D Representation of Construction Staging and Maintenance-of-Traffic

Cost of Visualization Services

The cost of the visualization services described herein are summarized in the table below.

Phase 1 - Existing and Proposed Conditions	
Software / Subscriptions	Cost
123BIM.com Gold Level - initial setup	\$ 1,100
123BIM.com Gold Level subscription (6 months)	\$ 4,800
Total - Software / Subscriptions	\$ 5,900
Model Development Services	Cost
Task 1 - Modeling of Existing Conditions	\$ 3,224
Task 2 - Modeling of Proposed Design	\$ 9,445
Task 3 - Flyover Video and Virtual Tour	\$ 2,226
Task 4 - Other / Miscellaneous	\$ 1,423
Total - Model Development Services	\$ 14,895
Total Cost - Phase 1	\$ 20,795
Phase 2 - Construction Staging	
Task 5-1 - Modeling of Construction Staging	\$ 9,527
Task 5-2 - Annotated Video Development	\$ 2,544
Total - Model Development Services	\$ 12,070
Total Cost - Phase 2	\$ 12,070
Total Proposal Cost	\$ 32,865

Model Development and Delivery Terms

- **Term** - This proposal is valid for 30 days. Costs and terms may change after 30 days.
- **Commencement of Work** - RDV will commence work on the Phase 1 version of the 3D model upon execution of a contract based on this proposal, receipt of the project data to be provided by BHC, and receipt of a Notification to Proceed.
- **Subscription** - the 123BIM.com subscription period will begin upon Commencement of Work.
- **Phase 1 Delivery** - 3D project models will be delivered by making the model files available for viewing and downloading from the 123BIM.com web collaboration service. The 3D project model shall be developed and delivered as follows:
 - **Initial Delivery - (90%)** — initial development of the Phase 1 version of the 3D model, based on the Scope of Work and Deliverables described in this proposal. The initial model will be delivered within ten business days of Commencement of Work.
 - **Final Delivery - (100%)** —updates to the 3D model to address comments provided by BHC following review of the Initial Delivery model. Requested changes and additions must be limited to the Scope of Work and Deliverables described in this proposal and will be provided to RDV

within five business days of the Initial Delivery. The final model will be delivered within five business days of receiving the requested changes and additions.

- **Phase 2 Delivery** - RDV will commence work on updating the 3D model to add construction staging upon receipt of the staging data and receipt of a Notification to Proceed.
- **Payments** – RDV will submit invoices for services as follows for payment within thirty days:
 - RDV will submit an invoice for activation and setup of the 123BIM.com project subscription upon commencement of work;
 - RDV will submit monthly invoices for model creation and development services based on verified progress of development of deliverables.
- **Taxes** – The above fees do not include state sales tax. Should any sales tax be required, that amount should be paid in addition to the above fees according to the relevant regulations.