TO: All Departments  
FROM: Office of Procurement Services  
SUBJECT: Contract for CAD/RMS/CIVIL PROCESS and MOBILE SYSTEMS  

Attached to this letter is published an effective purchasing contract for products and/or services to be supplied to Maricopa County activities as awarded by Maricopa County on February 22, 2012.

All purchases of products and/or services listed on the attached pages of this letter are to be obtained from the vendor holding the contract. Individuals are responsible to the vendor for purchases made outside of contracts. The contract period is indicated above.

Wes Baysinger, Chief Procurement Officer  
Office of Procurement Services  

BW/ua  
Attach  

Copy to: Office of Procurement Services
CONTRACT PURSUANT TO RFP

This contract is entered into this 22rd day of February, 2012 (“Contract”) by and between Maricopa County (“County” or “Maricopa County”), a political subdivision of the State of Arizona, and Intergraph Corporation, a Delaware corporation (“Contractor”) for the purchase and implementation of a Computer Aided Dispatch (“CAD”), Records Management System (“RMS”), and Mobile for Police Systems (“MPS”) and associated products and services set forth in Exhibit A – Pricing and Detail Summary (hereafter individually identified as “Subsystem” and collectively identified as “System”).

1.0 CONTRACT TERM:

1.1 This Contract is for a term of five (5) years, beginning on the 22nd day of February, 2012 and ending the 28th day of February, 2017.

1.2 The County may, at its option and with the agreement of the Contractor, renew the term of this Contract for additional terms up to a maximum of five (5) years. The County shall notify the Contractor in writing of its intent to extend the Contract term at least thirty (30) calendar days prior to the expiration of the original contract term, or any additional term thereafter.

2.0 ACCEPTANCE TEST PROCESS:

The acceptance test process shall include three phases: the acceptance testing period, the reliability test period, and the final acceptance as set forth in Exhibit C, Attachment G.

3.0 ORDERS AND PAYMENTS:

3.1 As consideration for performance of the duties described herein, County shall pay Contractor the sum(s) stated in Exhibit A – Pricing and Detail Summary and Exhibit B – Payment Milestones or other pricing document, order form or purchase order as mutually agreed by the parties.

3.2 TERMS OF PAYMENT:

3.2.1 Project Payments. The terms of payment shall be net thirty (30) days from the date of invoice, with invoicing to occur upon certification from Contractor that it has successfully completed the milestones as set forth in the Contract.

Once Contractor agrees that a corresponding milestone has been successfully completed, the County’s project managers will sign-off on the milestone completion form within ten (10) workdays. If a deliverable is rejected for any reason, Maricopa County will provide a written description of the deficiencies to Contractor within ten (10) workdays. If
Maricopa County fails to accept or reject a deliverable within ten (10) workdays, or if Maricopa County elects to place a Subsystem into production operation, then Contractor will be paid the full Contract price for the milestone.

Payment shall be made upon the County’s receipt of a properly completed invoice. The County shall notify Contractor in writing if an invoice does not conform with this Contract, including sufficient details of any non-conformity, within ten (10) workdays of the invoice date.

3.2.2 Maintenance Payments. Charges for maintenance services under Exhibit D are due and payable annually and in advance. All charges are due net thirty (30) calendar days from the date of invoice or prior to the beginning of the applicable Coverage Period (as defined in Exhibit D), whichever is earlier. Charges for Covered Products (as defined in Exhibit D) added during a Coverage Period shall be prorated to the remaining months of the Coverage Period, in whole month increments only, and such charges shall be due and payable in full upon receipt of invoice.

3.3 DELIVERY AND INSTALLATION:

3.3.1 The Contractor shall be responsible to install and present for inspection all equipment, if applicable, in a complete and ready-for-use condition with all components functioning, cleaned and tested.

3.3.2 Delivery shall be F.O.B. Destination, Freight Prepaid.

3.4 INVOICES:

3.4.1 The Contractor shall submit two (2) legible copies of their detailed invoice before payment(s) can be made. At a minimum, the invoice must provide the following information:

- Company name, address and contact
- County bill-to name and contact information
- Contract serial number
- County purchase order number
- Invoice number and date
- Payment terms
- Description of service provided
- Extended price
- Total Amount Due

3.4.2 Problems regarding billing or invoicing shall be directed to the County as listed on the Purchase Order.

3.4.3 Payment shall be made to the Contractor by Accounts Payable through the Maricopa County Vendor Express Payment Program. This is an Electronic Funds Transfer (EFT) process. After Award the Contractor shall fill out an EFT Enrollment form located on the County Department of Finance Website as a fillable PDF document (www.maricopa.gov/finance/)

3.4.4 EFT payments to the routing and account numbers designated by the Contractor will include the details on the specific invoices that the payment covers. The Contractor is required to discuss remittance delivery capabilities with their designated financial institution for access to those details.
3.4.5 The Contractor shall have all rights and remedies available for payment default as set forth in Arizona Revised Statutes §35-342 and 11-622.

3.5 TAX (SERVICES):

All amounts required to be paid hereunder do not include any amount for taxes or levy (including interest and penalties). The County shall reimburse Contractor and hold Contractor harmless for all sales, use, VAT, excise, property or other taxes or levies which Contractor is required to collect or remit to applicable tax authorities. This provision does not apply to Contractor’s income or franchise taxes, or any taxes for which The County is exempt, provided the County has furnished Contractor with a valid tax exemption certificate.

4.0 AVAILABILITY OF FUNDS:

If any actions are taken by any state agency, Federal department or any other agency or instrumentality to suspend, decrease, or terminate its fiscal obligations under, or in connection with, this Contract, County may terminate its obligations under, or in connection with, this Contract as set forth in Section 6.8 – Termination for Convenience.

5.0 DUTIES:

5.1 The Contractor shall perform all duties stated in Exhibits or as otherwise directed in writing by the Procurement Officer and agreed by the Contractor.

5.2 During the Contract term, County shall provide Contractor’s personnel with adequate workspace as may be required by Contractor to carry out its contractual obligations.

6.0 TERMS and CONDITIONS:

6.1 GENERAL INDEMNIFICATION:

6.1.1 To the fullest extent permitted by law, Contractor shall defend, indemnify, and hold harmless County, its agents, representatives, officers, directors, officials, and employees from and against all third party claims, damages, losses and expenses, including, but not limited to, attorney fees, court costs, expert witness fees, and the cost of appellate proceedings, relating to personal injury and property damage, arising out of, or alleged to have resulted from Contractor’s negligent acts, errors, omissions, mistakes or malfeasance relating to the performance of this Contract. Contractor’s duty to defend, indemnify and hold harmless County, its agents, representatives, officers, directors, officials, and employees shall arise in connection with any claim, damage, loss or expense that is caused by any negligent acts, errors, omissions or mistakes in the performance of this Contract by the Contractor, as well as any person or entity for whose acts, errors, omissions, mistakes or malfeasance Contractor may be legally liable including Contractor’s subcontractors.

6.1.2 The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

6.1.3 The scope of this indemnification does not extend to the sole negligence of County.

6.2 LIMITATION OF LIABILITY:

Contractor shall not be liable for any indirect, consequential, incidental, special or punitive damages arising out of or in connection with the warranties, or the performance of this Contract, including, but not limited to, loss of revenue or profit, or loss or corruption of data. Except for
damages arising out of Section 6.1.1 due to Contractor’s negligence or claims during any maintenance period, Contractor’s total liability for any and all damages whatsoever arising out of or in any way related to this Contract from any cause shall not exceed a cumulative maximum Five Million ($5,000,000) Dollars under this Contract. Contractor’s total liability for any and all damages during any maintenance period shall not exceed the amounts paid by the County for annual maintenance for the year in which the claim arises.

Except as otherwise provided by applicable law, no claim, regardless of form, arising out of or in connection with this Contract may be brought by the Maricopa County more than two (2) years after the cause of action has occurred.

6.3 INSURANCE REQUIREMENTS:

6.3.1 Contractor, at Contractor’s own expense, shall purchase and maintain the herein stipulated minimum insurance from a company or companies duly licensed by the State of Arizona or authorized to do business in the State of Arizona and possessing a current A.M. Best, Inc. rating of A-, VII or higher.

6.3.2 All insurance required herein shall be maintained in full force and effect until all work or service required to be performed under the terms of the Contract is satisfactorily completed and formally accepted. Failure to do so may, at the sole discretion of County, constitute a material breach of this Contract.

6.3.3 Contractor’s insurance shall be primary insurance as respects County, and any insurance or self-insurance maintained by County shall not contribute to it.

6.3.4 Any failure to comply with the claim reporting provisions of the insurance policies or any breach of an insurance policy warranty may affect the County’s right to coverage afforded under the insurance policies, however, it will not exclude the County’s right to recover from Contractor as otherwise set forth in this Contract.

6.3.5 The insurance policies may provide coverage that contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to County under such policies. Contractor shall be solely responsible for the deductible and/or self-insured retention.

6.3.6 County reserves the right to request and to receive, within 10 working days, a certificate of insurance evidencing coverage hereunder. County shall not be obligated to review policies and/or endorsements or to advise Contractor of any deficiencies in such policies and endorsements, and receipt of a certificate of insurance shall not relieve Contractor from, or be deemed a waiver of County’s right to insist on strict fulfillment of Contractor’s obligations under this Contract.

6.3.7 The insurance policies required by this Contract, except Workers’ Compensation, and Errors and Omissions, shall name County, its agents, representatives, officers, directors, officials and employees as Additional Insured.

6.3.8

6.3.9 Commercial General Liability.

Commercial General Liability insurance with a limit of not less than $2,000,000 for each occurrence, $4,000,000 Products/Completed Operations Aggregate, and $4,000,000 General Aggregate Limit. The policy shall include coverage for bodily injury, broad form property damage, personal injury, products and completed operations and blanket contractual coverage, and shall not contain any provision which would serve to limit third party action over claims.
6.3.10 Automobile Liability.

Commercial/Business Automobile Liability insurance with a combined single limit for bodily injury and property damage of not less than $1,000,000 each occurrence with respect to any of the Contractor’s owned, hired, and non-owned vehicles assigned to or used in performance of the Contractor’s work or services under this Contract.

6.3.11 Workers’ Compensation.

6.3.11.1 Workers’ Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of Contractor’s employees engaged in the performance of the work or services under this Contract; and Employer’s Liability insurance of not less than $1,000,000 for each accident, $1,000,000 disease for each employee, and $1,000,000 disease policy limit.

6.3.11.2 Contractor waives all rights against County and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the Workers’ Compensation and Employer’s Liability or commercial umbrella liability insurance obtained by Contractor pursuant to this Contract.

6.3.12 Electronic Errors and Omissions Insurance.

Electronic Errors and Omissions insurance which will insure and provide coverage for errors or omissions of the Contractor, with limits of no less than $5,000,000 for each claim.

6.3.13 Certificates of Insurance.

6.3.13.1 Prior to commencing work or services under this Contract, Contractor shall furnish the County with certificates of insurance. issued by Contractor’s insurer(s), as evidence that policies providing the required coverage, conditions and limits required by this Contract are in full force and effect. Such certificates shall identify this contract number and title.

6.3.13.2 In the event any insurance policy (ies) required by this Contract is (are) written on a “claims made” basis, coverage shall extend for two (2) years past completion and acceptance of Contractor’s work or services and as evidenced by annual Certificates of Insurance.

6.3.13.3 If a policy does expire during the life of the Contract, a renewal certificate must be sent to County fifteen (15) days prior to the expiration date.

6.3.14 Cancellation and Expiration Notice.

Insurance required herein shall not be permitted to expire or canceled thirty (30) days prior Contractor written notice to the County.

6.4 WARRANTY:

6.4.1 Contractor products are warranted, when properly installed, to operate in substantial conformity with product specifications during the initial warranty period and for any extended warranty which may be purchased thereafter. Contractor products are provided with a non-mission critical warranty (5 days per week, 8 hours per day) up to the point of Subsystem cutover to live operation. The cost of this warranty is included in the price of the Subsystem. After the initial warranty period, Maricopa County may purchase an
extended warranty or Maintenance services that include mission critical support (7 days per week, 24 hours per day). The cost and length of time for an extended warranty or Maintenance services, if purchased, is reflected in the pricing. The foregoing warranties shall be for repair or replacement, at the option of the Contractor. The foregoing warranties are void if failure is due to modification, misuse, abnormal conditions of operation.

6.4.2 Third-party products are provided with a pass-thru-warranty from the original manufacturer.

6.4.3 CONTRACTOR DISCLAIMS (TO THE EXTENT PERMITTED BY LAW) ALL WARRANTIES ON PRODUCTS FURNISHED HEREUNDER, EXCEPT THOSE SPECIFICALLY STATED ABOVE, INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND REPRESENTS THE FULL AND TOTAL OBLIGATION AND/OR LIABILITY OF CONTRACTOR.

6.5 PROCUREMENT CARD ORDERING CAPABILITY:

The County may determine to use a MasterCard Procurement Card, to place and make payment for orders under the Contract.

6.6 INTERNET ORDERING CAPABILITY:

The County intends, at its option, to use the Internet to communicate and to place orders under this Contract.

6.7 NOTICES:

All notices given pursuant to the terms of this Contract shall be addressed to:

For County:

Maricopa County
Office of Procurement Services
Attn: Chief Procurement Officer
320 West Lincoln Street
Phoenix, Arizona 85003-2494

For Contractor:

Intergraph Corporation
Attn: Alan R. Estep, Executive Manager, Americas Customer Contracts
19 Interpro Road
Madison, AL 35758

6.8 TERMINATION FOR CONVENIENCE:

The County reserves the right to terminate the Contract in whole or in part at any time, when in the best interests of the County without penalty or recourse. The Procurement Officer shall provide thirty (30) days written notice to Contractor. Upon receipt of the written notice, the Contractor shall immediately stop all work, as directed in the notice, notify all subcontractors of the effective date of the termination and minimize all further costs to the County. The Contractor shall be entitled to receive just and equitable compensation for all work in progress, milestones completed and subcontractor termination charges incurred before the effective date of the termination.
6.9 TERMINATION FOR DEFAULT:

6.9.1 In addition to the rights reserved in the Contract, the County may terminate the Contract in whole or in part due to the failure of the Contractor to comply with any material term or condition of the Contract, to acquire and maintain all required insurance policies, licenses and permits, or to make satisfactory progress in performing the Contract. The Procurement Officer shall provide thirty (30) day written notice of the termination and the reasons for it to the Contractor. If Contractor fails to cure any material breach of the Contract within a thirty (30) day period after having received written notice, the Procurement Officer shall provide written notice of the termination and the reasons for it to the Contractor.

6.9.2 Contractor may terminate the Contract by written notice to County effective immediately upon receipt, if the County fails to cure any material breach of the Contract within a thirty (30) day period after Contractor having provided written notice to the County detailing the breach and requesting the breach be cured.

6.9.3 Upon termination under this paragraph, all goods, materials, documents, data and reports (other than licensed software) prepared by the Contractor under the Contract shall become the property of and be delivered to the County on demand after payment in full for said items.

6.9.4 The County may, upon termination of this Contract, procure, on terms and in the manner that it deems appropriate, materials or services to replace those under this Contract.

6.9.5 The Contractor shall continue to perform, in accordance with the requirements of the Contract, up to the date of termination, as directed in the termination notice.

6.10 STATUTORY RIGHT OF CANCELLATION FOR CONFLICT OF INTEREST:

Notice is given that pursuant to A.R.S. §38-511 the County may cancel this Contract without penalty or further obligation within three years after execution of the contract, if any person significantly involved in initiating, negotiating, securing, drafting or creating the contract on behalf of the County is at any time while the Contract or any extension of the Contract is in effect, an employee or agent of any other party to the Contract in any capacity or consultant to any other party of the Contract with respect to the subject matter of the Contract. Additionally, pursuant to A.R.S §38-511 the County may recoup any fee or commission paid or due to any person significantly involved in initiating, negotiating, securing, drafting or creating the contract on behalf of the County from any other party to the contract arising as the result of the Contract.

6.11 OFFSET FOR DAMAGES:

In addition to all other remedies at law or equity, either party may offset from any money due to the other party for damages resulting from breach or deficiencies in performance under this Contract. The Procurement Officer or Contracts Manager (as the case may be) shall provide written notice to other party detailing the breach requesting that the breach be cured. If the breaching party fails to cure any material breach of the Contract within a thirty (30) day period after having received written notice, the Procurement / Contracts Manager (as the case may be) shall provide written notice of the offset and the reasons for it to the breaching party prior to any offset being deducted.

6.12 RELATIONSHIPS:

In the performance of the services described herein, the Contractor shall act solely as an independent contractor, and nothing herein or implied herein shall at any time be construed as to
create the relationship of employer and employee, partnership, principal and agent, or joint venture between the District and the Contractor.

6.13 ASSIGNMENT/ SUBCONTRACTING:

Neither party shall assign or transfer this Contract nor any rights or obligations thereunder without the express written consent of the other party. Such written consent shall not be unreasonably withheld. Notwithstanding the foregoing, Contractor may assign its rights and obligations under this Contract without the approval of the County to a third party in connection with a merger, consolidation, liquidation or reorganization of Contractor or its wholly owned subsidiaries or affiliates. Any other assignment of the Contract or any rights or obligations under the Contract without the express written consent of the other party will be invalid.

The Contractor may not subcontract to another party for performance of the terms and conditions hereof without the written consent of the County, which shall not be unreasonably withheld. All correspondence authorizing subcontracting must reference the Proposal Serial Number and identify the job project.

6.14 AMENDMENTS:

All amendments to this Contract shall be in writing and approved/signed by both parties. Maricopa County Materials Management shall be responsible for approving all amendments for Maricopa County.

6.15 ACCESS TO AND RETENTION OF RECORDS FOR THE PURPOSE OF AUDIT AND/OR OTHER REVIEW:

6.15.1 In accordance with section MCI 367 of the Maricopa County Procurement Code the Contractor agrees to retain all books, records, accounts, statements, reports, files, and other records and back-up documentation relevant to this Contract for six (6) years after final payment or until after the resolution of any audit questions which could be more than six (6) years, whichever is latest. The County, Federal or State auditors and any other persons duly authorized by Maricopa County shall have full access to, and the right to examine, copy and make use of, any and all said materials. .

6.15.2 If the Contractor’s books, records, accounts, statements, reports, files, and other records and back-up documentation relevant to this Contract are not sufficient to support and document that requested services were provided, the Contractor shall reimburse Maricopa County for the services not so adequately supported and documented.

6.16 ALTERNATIVE DISPUTE RESOLUTION:

6.16.1 After the exhaustion of the administrative remedies provided in the Maricopa County Procurement Code, the parties may agree, in writing, to arbitration. Provided the parties participate in the arbitration in good faith, such arbitration is not binding and the parties are entitled to pursue the matter in state or federal court sitting in Maricopa County for a de novo determination on the law and facts. If the parties cannot agree on an arbitrator, each party will designate an arbitrator and those two arbitrators will agree on a third arbitrator. The three arbitrators will then serve as a panel to consider the arbitration. The parties will be equally responsible for the compensation for the arbitrator(s). The hearing, evidence, and procedure will be in accordance with Rule 74 of the Arizona Rules of Civil Procedure. Within ten (10) days of the completion of the hearing the arbitrator(s) shall:
6.16.1.1 Render a decision;

6.16.1.2 Notify the parties that the exhibits are available for retrieval; and

6.16.1.3 Notify the parties of the decision in writing (a letter to the parties or their counsel shall suffice).

6.16.2 Within ten (10) days of the notice of decision, either party may submit to the arbitrator(s) a proposed form of award or other final disposition, including any form of award for attorneys’ fees and costs. Within five (5) days of receipt of the foregoing, the opposing party may file objections. Within ten (10) days of receipt of any objections, the arbitrator(s) shall pass upon the objections and prepare a signed award or other final disposition and mail copies to all parties or their counsel.

6.16.3 Any party which has appeared and participated in good faith in the arbitration proceedings may appeal from the award or other final disposition by filing an action in the state or federal court sitting in Maricopa County within twenty (20) days after date of the award or other final disposition. Unless such action is dismissed for failure to prosecute, such action will make the award or other final disposition of the arbitrator(s) a nullity.

6.17 SEVERABILITY:

The invalidity, in whole or in part, of any provision of this Contract shall not void or affect the validity of any other provision of this Contract.

6.18 RIGHTS IN DATA/OWNERSHIP OF INTELLECTUAL PROPERTY:

Contractor shall retain ownership of all deliverables under this Contract and the software is licensed to County pursuant to the End User License Agreement attached hereto as Exhibit D. Third-party software is licensed to County pursuant to the Software License Agreement delivered with the software product. The County shall retain ownership of its data and reports resulting from this contract. The parties agree as follows regarding rights in data and ownership of intellectual property.

**County Owns County IP.** County reserves all rights, including, but not limited to, ownership, title, intellectual property rights and all other rights and interest in and to any computer programs (in object or source code format or any other form), know-how, inventions, processes, data bases, documentation, training materials and any other intellectual property and any tangible embodiments of it (collectively “**Intellectual Property**” or “**IP**”) that County makes available to Contractor (collectively “**County IP**”).

Exhibit D is revised/clarified to reflect the following understanding of the parties:

- The Important-Read Carefully section is governed by the terms and conditions of this contract including all exhibits.
- Under Section 5.0 (Audit), the County will not be liable for interest in the amount of two percent (2%) per month or higher rate allowed by applicable law.
- Notwithstanding anything in the Exhibit D to the contrary, comparable Sections of this Contract shall take precedent over the following Sections of Exhibit D: Sections 3.3 (Indemnification by You), 6.2.1 (Intellectual Property Infringement-Remedy by Intergraph), 6.2.2 (Indemnification by You), 7.0 (Limited Warranties) 8.0 (Warranty Disclaimers), 9.0 (Limitation of Liability), 11.1 (Entire Agreement), 11.2 (Severability), 11.5 (Notices), 11.6 (Assignment), 11.9 (Governing Law; Venue and Jurisdiction), 11.10 (Waiver of Jury Trial), 11.11 (Injunctive Relief; Cumulative Remedies), and 11.12 (Attorneys’ Fees and Costs).
In addition to the terms and conditions of Contractor’s End-User License Agreement in Exhibit D, Maricopa County shall have the right to use the Software Package(s) identified as a site license in Contractor’s Quotation on an enterprise basis by Maricopa County for the Maricopa County Sheriff’s Office (“Agency”).

Site licenses permit the Agency to use the specific Software Package(s) named in Contractor’s Quotation and to use an unlimited number of license quantities as needed without an additional software license purchase fee while the site license Software Package(s) remain under a valid maintenance contract with the Contractor.

Notwithstanding anything in Contractor’s pricing to the contrary, maintenance costs for site licenses will be adjusted to match sustained actual usage after five (5) years of production use of the site license (after cutover). Contractor will audit the actual sustained usage levels at the end of the first five (5) year period (including extended warranty) and will readjust the maintenance cost upward (if actual usage increases). Thereafter, Contractor will audit the actual usage levels and readjust maintenance cost upward (if actual usage increases) every three (3) years following the initial audit period.

The site license does not apply to any Software Package for which Contractor would owe a third-party royalty, any third-party software furnished to Maricopa County by Contractor, and any other Software Package not specifically identified in the Contract as a site license. No other use is licensed.

6.19 INFRINGEMENT:

In the event of any proceeding (suit, claim, or action) against County arising from allegations that the system, or a portion thereof furnished by Contractor infringes U.S. patent, copyright, trade secret, or other proprietary right of any third-party, Contractor will, if such suit does not result from modifications made by County or contributory negligence on County’s part, defend County, at Contractor’s expense, provided County promptly notifies Contractor in writing of the allegation or claim. In the event of an indemnifiable event hereunder, Contractor shall make such defense by counsel of its own choosing and County shall cooperate with said counsel.

6.20 INTEGRATION:

This Contract represents the entire and integrated agreement between the parties and supersedes all prior negotiations, proposals, communications, understandings, representations, or agreements, whether oral or written, express or implied.

This Contract may not be amended or modified unless so done in writing signed by authorized representatives of both Parties. The pre-printed terms and conditions of any County purchase order or any other terms and conditions of a County purchase order which may conflict in any way with the terms and conditions of this Contract shall be void, even if issued subsequent to the effective date of this Contract, and shall not be deemed to constitute a change to this Contract.

6.21 VERIFICATION REGARDING COMPLIANCE WITH ARIZONA REVISED STATUTES §41-4401 AND FEDERAL IMMIGRATION LAWS AND REGULATIONS:

6.21.1 By entering into the Contract, the Contractor warrants compliance with the Immigration and Nationality Act (INA using e-verify) and all other federal immigration laws and regulations related to the immigration status of its employees and A.R.S. §23-214(A). The Contractor shall obtain statements from its subcontractors certifying compliance and shall furnish the statements to the Procurement Officer upon request. These warranties shall remain in effect through the term of the Contract. The Contractor and its subcontractors shall also maintain Employment Eligibility Verification forms (I-9) as required by the Immigration Reform and Control Act of 1986, as amended from time to time, for all
employees performing work under the Contract and verify employee compliance using the E-verify system and shall keep a record of the verification for the duration of the employee’s employment or at least three years, whichever is longer. I-9 forms are available for download at USCIS.GOV.

6.21.2 Subject to Contractor’s security requirements and to the extent permitted by law, the County retains the legal right to inspect Contractor and subcontractor employee documents performing work under this Contract to verify compliance with paragraph 6.21.1 of this Section. Contractor and subcontractor shall be given reasonable notice of the County’s intent to inspect and shall make the documents available at the time and date specified. Should the County suspect or find that the Contractor or any of its subcontractors are not in compliance, the County will consider this a material breach of the contract and may pursue any and all remedies allowed by law, including, but not limited to: suspension of work, termination of the Contract for default, and suspension and/or debarment of the Contractor. All costs necessary to verify compliance are the responsibility of the County.

6.22 VERIFICATION REGARDING COMPLIANCE WITH ARIZONA REVISED STATUTES §§35-391.06 AND 35-393.06 BUSINESS RELATIONS WITH SUDAN AND IRAN:

6.22.1 By entering into the Contract, the Contractor certifies it does not have scrutinized business operations in Sudan or Iran. The Contractor shall obtain statements from its subcontractors certifying compliance and shall furnish the statements to the Procurement Officer upon request. These warranties shall remain in effect through the term of the Contract.

6.22.2 The County may request verification of compliance for the Contractor or subcontractor performing work under the Contract. Should the County suspect or find that the Contractor or any of its subcontractors are not in compliance, the County may pursue any and all remedies allowed by law, including, but not limited to: suspension of work, termination of the Contract for default, and suspension and/or debarment of the Contractor. All costs necessary to verify compliance are the responsibility of the County.

6.23 CONTRACTOR LICENSE REQUIREMENT:

6.23.1 The Contractor shall procure all permits, insurance, licenses and pay the charges and fees necessary and incidental to the lawful conduct of his/her business, and as necessary complete any required certification requirements, required by any and all governmental or non-governmental entities as mandated to maintain compliance with and in good standing for all permits and/or licenses. The Contractor shall keep fully informed of existing and future trade or industry requirements, Federal, State and Local laws, ordinances, and regulations which in any manner affect the fulfillment of a Contract and shall comply with the same. Contractor shall immediately notify both Materials Management and the using agency of any and all changes concerning permits, insurance or licenses.

6.23.2 Contractors furnishing finished products, materials or articles of merchandise that will require installation or attachment as part of the Contract, shall possess any licenses required. A Contractor is not relieved of its obligation to possess the required licenses by subcontracting of the labor portion of the Contract. Contractors are advised to contact the Arizona Registrar of Contractors, Chief of Licensing, at (602) 542-1525 to ascertain licensing requirements for a particular contract. Contractors shall identify which license(s), if any, the Registrar of Contractors requires for performance of the Contract.
6.24 CERTIFICATION REGARDING DEBARMENT AND SUSPENSION

6.24.1 The undersigned (authorized official signing for the Contractor) certifies to the best of his or her knowledge and belief, that the Contractor, defined as the primary participant in accordance with 45 CFR Part 76, and its principals:

6.24.2 are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal Department or agency;

6.24.3 have not within 3-year period preceding this Contract been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statues or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

6.24.4 are not presently indicted or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and

6.24.5 have not within a 3-year period preceding this Contract had one or more public transaction (Federal, State or local) terminated for cause of default.

6.24.6 Should the Contractor not be able to provide this certification, an explanation as to why should be attached to the Contact.

6.25 PRICES:

Contractor warrants that its list prices extended to County under this Contract are no higher than those paid to other similar governmental customers within the State of Arizona (except to the extent that a governmental customer purchases under Contractor’s GSA Schedule) for the same products or services for comparable quantities under substantially similar terms and conditions.

6.26 GOVERNING LAW:

This Contract shall be governed by the laws of the state of Arizona. Venue for any actions or lawsuits involving this Contract will be in Maricopa County Superior Court or in the United States District Court for the District of Arizona, sitting in Phoenix, Arizona.

6.27 GOVERNING TERMS AND CONDITIONS/ORDER OF PRECEDENCE:

In the event of a conflict in the provisions of this Contract the governing document shall prevail in the following order.

6.27.1 Base Contract and Exhibits A and B
6.27.2 Exhibit C
6.27.3 Exhibits D and E
6.27.4 All other Exhibits referenced in Section 6.30 in their aggregate and in the order listed in 6.30 below.

6.28 INFLUENCE:

As prescribed in MC1-1202 of the Maricopa County Procurement Code, any effort to influence an employee or agent to breach the Maricopa County Ethical Code of Conduct or any ethical conduct, may be grounds for Disbarment or Suspension under MC1-902. An attempt to influence includes, but is not limited to:
6.28.1 A Person offering or providing a gratuity, gift, tip, present, donation, money, entertainment or educational passes or tickets, or any type valuable contribution or subsidy,

6.28.2 That is offered or given with the intent to influence a decision, obtain a contract, garner favorable treatment, or gain favorable consideration of any kind.

6.28.3 If a Person attempts to influence any employee or agent of Maricopa County, the Chief Procurement Officer, or his designee, reserves the right to seek any remedy provided by the Maricopa County Procurement Code, any remedy in equity or in the law, or any remedy provided by this contract.

6.29 CHANGE ORDERS:

Either party may request a change to the scope of work required under this Contract on any task including but not limited to, alterations, additions, deviations, and omissions from or to the scope of work. Contractor shall provide County with a written assessment within a reasonable time identifying the price and schedule impact of implementing the change. Neither party shall be obligated to commence work on the requested change until they have agreed in writing to an equitable adjustment. If a change to the contract pricing occurs pursuant to this paragraph, Contractor will provide the County with a written change order identifying the pricing impact. The County may purchase additional products which are optioned in Exhibit A for twelve (12) months from the date of execution of this Contract according to the pricing in Exhibit A. Thereafter, the County may purchase additional products at the Contractor’s then current list pricing. If and when Contractor introduces new products, Contractor will offer the County a migration plan and strategy to insure the viability of existing products and/or integration with new products that have been released.

6.30 INCORPORATION OF DOCUMENTS:

The following are to be attached to and made part of this Contract:

6.30.1 Exhibit A, Pricing and Detail Summary;

6.30.2 Exhibit B, Payment Milestones;

6.30.3 Exhibit C, Statement of Work and Attachments;

Attachment A – Draft Project Schedule
Attachment B – Project Deliverable Sign-off Form
Attachment C – CAD-LRMS Configuration Diagram
Attachment D – Interface Descriptions
Attachment E – Training Curriculum
Attachment F – Standard Hardware Configuration Guide
Attachment G – Acceptance Test Plan
Attachment H – Contract Clarifications
Attachment I – Customer Support Center

6.30.4 Exhibit D, End User License Agreement;

6.30.5 Exhibit E, U.S. Maintenance Terms and Conditions for Sale;
7.0 SOURCE CODE ESCROW:

The Contractor shall provide all source code and any updates or fixes for the Contractor Commercial Off the Shelf (“COTS”) application software that Maricopa County has purchased from Contractor for safekeeping with Iron Mountain Intellectual Property Management (“IMIPM”); an escrow agent located at 2100 Norcross Parkway, Suite 150, Norcross, Georgia 30071. The software source deposited with the escrow agent will be a snapshot of all source code maintained by Contractor in the form of a Microsoft Visual Source Safe Archive. In this way, as beneficiary of the escrow agreement between Contractor and IMIPM, Maricopa County will have access to all source code of the products that they license for all versions of the software. Upon taking possession of the source code, Maricopa County will have the right to use the source for products that they license in the versions currently installed on the System or any subsequent versions in the archive. Contractor will make a deposit of the Source Safe Archive with the escrow agent once every six (6) months.

Maricopa County hereby agrees to pay the yearly standard fee for a beneficiary of the source code.

Maricopa County shall have access to the source code only in the event Contractor becomes unable to, or otherwise fails to, maintain the software during the warranty period or during the maintenance period, or if Licensor decides to stop support of the software application(s), or Contractor becomes bankrupt.

Upon Maricopa County taking possession of the source code, Maricopa County hereby agrees as follows:

(1) Maricopa County accepts full and total responsibility for the safekeeping of the source code. Maricopa County agrees that such source code shall be subject to the restrictions of transfer, sale, and reproduction placed on the software itself as stated in the software license signed by all parties.

(2) Maricopa County agrees to only use source code related to applications for which they own a license. There will be source from other applications in the archive.

(3) Maricopa County agrees that any unauthorized release of the source code will cause irreparable harm to Contractor. Therefore, Maricopa County agrees to compensate Contractor for any and all damages Contractor suffers, to include reasonable attorney’s fees, resulting directly or indirectly from, but not limited to, the mishandling, misuse, or theft of the source code, regardless of intent, or the absence thereof, by Maricopa County, its employees, former employees, agents and third-party associates if so ordered by the court. Notwithstanding the foregoing, Maricopa County agrees that Contractor is entitled to an immediate injunction to stop any further alleged or actual disclosure.

(4) No license under any trademark, patent, copyright, or any other intellectual property right, is either granted or implied by the disclosure of the source code to Maricopa County. The Contractor’s disclosure of the source code to Maricopa County shall not constitute any representation, warranty, assurance, guarantee or inducement by the Contractor to Maricopa County of any kind, and, in particular, with respect to the non-infringement of trademarks, patents, copyrights, or any other intellectual property rights, or other rights of third persons or of Contractor.

(5) Contractor will not be responsible for maintaining the source code. Furthermore, Contractor will not be liable for any consequences related to the use of source code modified by Maricopa County.
8.0 DISCLAIMER

Any commercial off-the-shelf product information Contractor has shared with the County during the proposal / contract activities to date, was to provide an understanding of Contractor’s current expected direction, roadmap or vision and is subject to change at any time at Contractor’s sole discretion. Contractor does not commit to develop the future features, functions and products discussed in this material beyond that which is specifically committed to be provided by Contractor as part of the intended Contract. The County should not factor any future features, functions or products into its current buying decision since there is no assurance that such future features, functions or products will be developed. When and if these future features, functions or products are developed, they will generally be available for licensing by Contractor.

9.0 COOPERATIVE PURCHASING

This Contract may be extended, with the prior authorization of the Contractor, to other State or local government entities in the State of Arizona (“Other Public Entities”) to permit their use of the same unit prices and the same products under this Contract. Services and maintenance services will be priced independently for the given scope offered to the Other Public Entities. Contractor shall deal directly with the Other Public Entities utilizing the Contract concerning issuance of purchase orders, contractual disputes, invoicing and payment. It is Contractor’s responsibility to notify the Other Public Entities of the availability of the Contract. Other Public Entities desiring to use the Contract shall make their own legal determination as to whether the use of the Contract is consistent with their laws, regulations, and other policies. The Other Public Entities will negotiate separate terms and conditions with the Contractor to govern such purchases.
IN WITNESS WHEREOF, this Contract is executed on the date set forth above.

CONTRACTOR

AUTHORIZED SIGNATURE

Jennifer Williams, Director, U.S. Sales Accounting
PRINTED NAME AND TITLE
19 Interpro Road, Madison, AL 35758
ADDRESS
March 6, 2012
DATE

MARICOPA COUNTY

CHAIRMAN, BOARD OF SUPERVISORS

MAY 3, 2012
DATE

ATTESTED

CLERK OF THE BOARD 02/21/12

OFFICE OF ENTERPRISE TECHNOLOGY

CHIEF INFORMATION OFFICER

Stephen R. Wetzel
DATE
3/9/12

MARICOPA COUNTY SHERIFF’S OFFICE

DEPUTY CHIEF

S. J. Bren
DATE
3/18/12

WINBOURNE CONSULTING, LLC

AUTHORIZED REPRESENTATIVE

DATE
March 7, 2012

APPROVED AS TO FORM

LEGAL COUNSEL

DATE
March 7, 2012
EXHIBIT B

PAYMENT MILESTONES
EXHIBIT C

STATEMENT OF WORK
### Maricopa AZ Draft Project Schedule

#### Intergraph CAD / Police RMS

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
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<td>34</td>
<td>Hardware Ordering / Initial COTS Software Installation</td>
<td>90 days</td>
<td>Thu 4/19/12</td>
<td>Fri 5/24/12</td>
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<td>35</td>
<td>Design Facility</td>
<td>3 days</td>
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<td>Provide an Equipment Location Plan</td>
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<td>38</td>
<td>Verify Hardware Placement</td>
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<td>Provide Network Connection Details</td>
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<td>Finalize Network Configuration</td>
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<td>Order / Install Hardware and Software</td>
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<td>County Orders Required CAD Server Hardware</td>
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<td>Server Hardware Received by County On Site</td>
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<td>22 days</td>
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<td>46</td>
<td>Intergraph installs CAD COTS Software for Training</td>
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<td>Mon 8/20/12</td>
<td>Fri 8/24/12</td>
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**Intergraph Corporation**  
Date: Tue 2/21/12

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**Task**  
- Split
- External Tasks
- Inactive Summary
- Manual Task
- Duration-only
- Deadline
- Manual Summary Rollup
- Start-only

**Milestone**  
- Finish-only
- Progress

**Summary**  
- Manual Task
- Duration-only
- Deadline
- Manual Summary Rollup
- Start-only

**Rolled Up Task**  
- Project Summary

**Rolled Up Milestone**  
- Inactive Task
- Manual Summary

**Rolled Up Progress**  
- Inactive Milestone
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<td>System Preliminary / Staging / Configuration / Deployment Phases</td>
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<td>System Preliminary Phase</td>
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<td>Initial I/CAD Map Development</td>
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<td>Thu 8/23/12</td>
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<td>County Compiles GIS Data to Intergraph Specifications</td>
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<td>Wed 5/2/12</td>
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<td>County Provides Translatable Map Data to Intergraph</td>
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<td>Intergraph Converts Data into Initial I/CAD Map (Map Build #1)</td>
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<td>Thu 6/7/12</td>
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<td>Map Roll Consulting for I/CAD Systems (IPST8004) &amp; Map Build #3</td>
<td>4 days</td>
<td>Thu 1/3/13</td>
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<td>81</td>
<td>CAD Configuration Issue Resolution</td>
<td>10 days</td>
<td>Thu 1/3/13</td>
<td>Thu 1/17/13</td>
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<tr>
<td>82</td>
<td>I/CAD Database Schema and Reports Overview (IPST2009)</td>
<td>3 days</td>
<td>Tue 1/18/13</td>
<td>Tue 1/26/13</td>
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<td>83</td>
<td>Reporting Consulting</td>
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<td>84</td>
<td>Intergraph Configures CAD Test and Training Environments (Remote)</td>
<td>5 days</td>
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<td>I/CAD Essentials for Trainers (IPST2011) # 1</td>
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<td>87</td>
<td>MPS for Trainers (TTT) (IPST2503) # 1</td>
<td>2 days</td>
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<td>4 days</td>
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<td>92</td>
<td>County Conducts End User Training for CAD Calltakers / Dispatchers</td>
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<td>County Conducts End User Training for MPS</td>
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<td>98</td>
<td>Execute I/CAD + MPS System Acceptance Tests</td>
<td>24 days</td>
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<td>106</td>
<td>I/CAD and MPS Cutover Readiness Review</td>
<td>5 days</td>
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<td>Commence Cutover of I/CAD and MPS System</td>
<td>5 days</td>
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<td>I/CAD and MPS 30 Day Reliability Test Period</td>
<td>23 days</td>
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<td>II/Incident Analyst Configuration &amp; Admin (IPST6001)</td>
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<td>122</td>
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<td>48 days</td>
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<td>138</td>
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<td>48 days</td>
<td>Fri 5/4/12</td>
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<td>139</td>
<td>Design Customizations</td>
<td>35 days</td>
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Intergraph Corporation Date: Tue 2/21/12
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<tr>
<td>143</td>
<td>COTS Product Installation in Production Environment</td>
<td>40 days</td>
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<td>Resolve Issues/Retest</td>
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<td>3 days</td>
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<tr>
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<td>Deliver Draft of Test Scenarios</td>
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<td>Wed 2/6/13</td>
<td>Wed 2/6/13</td>
</tr>
<tr>
<td>193</td>
<td>County Review Test Scenarios / Add Scenarios As Desired</td>
<td>20 days</td>
<td>Thu 2/7/13</td>
<td>Wed 3/6/13</td>
</tr>
<tr>
<td>194</td>
<td>Review County Test Scenario Revisions / Modify As Required</td>
<td>15 days</td>
<td>Thu 3/7/13</td>
<td>Wed 3/27/13</td>
</tr>
<tr>
<td>195</td>
<td>Approve Final Test Scenarios</td>
<td>5 days</td>
<td>Wed 3/27/13</td>
<td>Wed 4/1/13</td>
</tr>
<tr>
<td>196</td>
<td>RMS/FBR Integration and Testing (Production Environment)</td>
<td>52 days</td>
<td>Mon 12/17/12</td>
<td>Fri 3/8/13</td>
</tr>
<tr>
<td>197</td>
<td>Install Customized Software</td>
<td>32 days</td>
<td>Mon 12/17/12</td>
<td>Fri 3/8/13</td>
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<tr>
<td>198</td>
<td>Install Updated RMS/FBR Software</td>
<td>3 days</td>
<td>Mon 12/17/12</td>
<td>Wed 12/19/12</td>
</tr>
<tr>
<td>199</td>
<td>Install Final Interfaces Software</td>
<td>3 days</td>
<td>Wed 2/6/13</td>
<td>Fri 2/8/13</td>
</tr>
<tr>
<td>200</td>
<td>Conduct Integration &amp; Testing Activities</td>
<td>20 days</td>
<td>Mon 2/11/13</td>
<td>Fri 3/8/13</td>
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<tr>
<td>201</td>
<td>Conduct Systems Integration &amp; Testing</td>
<td>15 days</td>
<td>Mon 2/11/13</td>
<td>Fri 3/1/13</td>
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<tr>
<td>202</td>
<td>Resolve Issues / Retest</td>
<td>15 days</td>
<td>Mon 2/18/13</td>
<td>Fri 3/8/13</td>
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<tr>
<td>204</td>
<td>Conduct Functional Acceptance Tests (RTM optional)</td>
<td>4 days</td>
<td>Tue 4/9/13</td>
<td>Tue 4/9/13</td>
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<tr>
<td>205</td>
<td>Resolve Issues / Retest (As Required)</td>
<td>10 days</td>
<td>Wed 4/10/13</td>
<td>Tue 4/23/13</td>
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<tr>
<td>206</td>
<td>Document Test Results</td>
<td>1 day</td>
<td>Wed 4/24/13</td>
<td>Wed 4/24/13</td>
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<tr>
<td>207</td>
<td>Build Training Environment</td>
<td>13 days</td>
<td>Thu 4/25/13</td>
<td>Mon 5/13/13</td>
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<tr>
<td>208</td>
<td>Install Software in Training Environment</td>
<td>5 days</td>
<td>Wed 5/1/13</td>
<td>Wed 5/13/13</td>
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<tr>
<td>209</td>
<td>Conduct OA Testing</td>
<td>5 days</td>
<td>Wed 5/2/13</td>
<td>Wed 5/13/13</td>
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<tr>
<td>210</td>
<td>Resolve Issues / Retest</td>
<td>6 days</td>
<td>Tue 5/7/13</td>
<td>Mon 5/13/13</td>
</tr>
<tr>
<td>211</td>
<td>Product Documentation</td>
<td>50 days</td>
<td>Mon 12/17/12</td>
<td>Wed 3/6/13</td>
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<tr>
<td>212</td>
<td>Tailor Product Documentation to Reflect Any RMS/FBR Customizations</td>
<td>50 days</td>
<td>Mon 12/17/12</td>
<td>Wed 3/6/13</td>
</tr>
<tr>
<td>213</td>
<td>Training</td>
<td>123 days</td>
<td>Mon 2/11/13</td>
<td>Wed 7/31/13</td>
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<tr>
<td>214</td>
<td>Customize and Produce Training Materials</td>
<td>60 days</td>
<td>Fri 5/13/13</td>
<td>Fri 5/13/13</td>
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<tr>
<td>215</td>
<td>Implementation Team Training</td>
<td>3 days</td>
<td>Tue 5/14/13</td>
<td>Thu 5/16/13</td>
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<tr>
<td>216</td>
<td>Conduct System Overview Training</td>
<td>3 days</td>
<td>Tue 5/14/13</td>
<td>Thu 5/16/13</td>
</tr>
<tr>
<td>217</td>
<td>System Administrator Training</td>
<td>11 days</td>
<td>Mon 5/20/13</td>
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</tr>
<tr>
<td>218</td>
<td>Conduct FBR System Administrator Training</td>
<td>2 days</td>
<td>Mon 5/20/13</td>
<td>Tue 5/21/13</td>
</tr>
<tr>
<td>219</td>
<td>Conduct RMS System Administrator Training</td>
<td>3 days</td>
<td>Mon 5/27/13</td>
<td>Wed 5/28/13</td>
</tr>
<tr>
<td>220</td>
<td>Conduct Web Report Server Training</td>
<td>3 days</td>
<td>Thu 5/30/13</td>
<td>Mon 6/3/13</td>
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<tr>
<td>221</td>
<td>End User Training (Train-the-Trainer Format)</td>
<td>20 days</td>
<td>Thu 6/6/13</td>
<td>Wed 7/3/13</td>
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<tr>
<td>222</td>
<td>Conduct FBR Training</td>
<td>3 days</td>
<td>Thu 6/6/13</td>
<td>Mon 6/10/13</td>
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<tr>
<td>223</td>
<td>Conduct RMS Records / Administration Training</td>
<td>5 days</td>
<td>Mon 6/11/13</td>
<td>Mon 6/11/13</td>
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<tr>
<td>224</td>
<td>Conduct Patrol &amp; Investigator Training</td>
<td>4 days</td>
<td>Fri 6/11/13</td>
<td>Fri 6/14/13</td>
</tr>
<tr>
<td>225</td>
<td>Conduct Evidence Management Training</td>
<td>3 days</td>
<td>Tue 6/18/13</td>
<td>Thu 6/20/13</td>
</tr>
<tr>
<td>226</td>
<td>Conduct Personnel / Training Mgt Training</td>
<td>3 days</td>
<td>Thu 6/18/13</td>
<td>Thu 6/20/13</td>
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<tr>
<td>227</td>
<td>Conduct Crime Analysis Training</td>
<td>2 days</td>
<td>Fri 6/21/13</td>
<td>Mon 6/24/13</td>
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<tr>
<td>228</td>
<td>Conduct Train-the-Trainer Methodology Course</td>
<td>4 days</td>
<td>Fri 6/26/13</td>
<td>Wed 7/3/13</td>
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<tr>
<td>229</td>
<td>County Led Training</td>
<td>20 days</td>
<td>Thu 7/4/13</td>
<td>Wed 7/31/13</td>
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<tr>
<td>230</td>
<td>County Conduct FBR Training</td>
<td>4 wks</td>
<td>Thu 7/4/13</td>
<td>Wed 7/31/13</td>
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<td>231</td>
<td>County Conduct RMS Training</td>
<td>4 wks</td>
<td>Thu 7/4/13</td>
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<td>232</td>
<td>County Conduct JMS Training</td>
<td>4 wks</td>
<td>Thu 7/4/13</td>
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<td>233</td>
<td>County Conduct Crime Analysis Training</td>
<td>2 wks</td>
<td>Thu 7/4/13</td>
<td>Wed 7/11/13</td>
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<td>234</td>
<td>County Training Complete</td>
<td>0 days</td>
<td>Wed 7/31/13</td>
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<td>235</td>
<td>RMS/FBR SYSTEM CUTOVER ACTIVITIES</td>
<td>140 days</td>
<td>Fri 5/17/13</td>
<td>Thu 11/28/13</td>
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<td>236</td>
<td>Cutover Plan</td>
<td>25 days</td>
<td>Fri 5/17/13</td>
<td>Thu 6/20/13</td>
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<tr>
<td>237</td>
<td>Develop Cutover Plan, Draft</td>
<td>10 days</td>
<td>Fri 5/17/13</td>
<td>Thu 5/30/13</td>
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<tr>
<td>238</td>
<td>Review Cutover Plan, Draft</td>
<td>10 days</td>
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<td>Duration</td>
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<tr>
<td>239</td>
<td>Incorporate Comments and Deliver Cutover Plan, Final</td>
<td>5 days</td>
<td>Fri 6/14/13</td>
<td>Thu 6/20/13</td>
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<tr>
<td>240</td>
<td>Deploy Client Software</td>
<td>15 days</td>
<td>Fri 6/21/13</td>
<td>Thu 7/11/13</td>
</tr>
<tr>
<td>241</td>
<td>Deploy Client Software</td>
<td>15 days</td>
<td>Fri 6/21/13</td>
<td>Thu 7/11/13</td>
</tr>
<tr>
<td>242</td>
<td>Conduct Cutover Readiness Review</td>
<td>1 day</td>
<td>Thu 8/1/13</td>
<td>Thu 8/1/13</td>
</tr>
<tr>
<td>243</td>
<td>Conduct Cutover Readiness Review</td>
<td>1 day</td>
<td>Thu 8/1/13</td>
<td>Thu 8/1/13</td>
</tr>
<tr>
<td>244</td>
<td>RMS Data Conversion - Full &quot;Go Live&quot; Conversion</td>
<td>5 days</td>
<td>Fri 8/2/13</td>
<td>Thu 8/8/13</td>
</tr>
<tr>
<td>245</td>
<td>Export Legacy Data For Conversion (County)</td>
<td>2 days</td>
<td>Fri 8/2/13</td>
<td>Mon 8/6/13</td>
</tr>
<tr>
<td>246</td>
<td>Execute Conversion Scripts</td>
<td>3 days</td>
<td>Tue 8/6/13</td>
<td>Thu 8/8/13</td>
</tr>
<tr>
<td>247</td>
<td>RMS/FBR Cutover</td>
<td>4 days</td>
<td>Mon 8/12/13</td>
<td>Thu 8/15/13</td>
</tr>
<tr>
<td>248</td>
<td><strong>RMS / FBR Cutover to Live Operation</strong></td>
<td>0 days</td>
<td>Mon 8/12/13</td>
<td>Mon 8/12/13</td>
</tr>
<tr>
<td>249</td>
<td>On-Site Cutover Support</td>
<td>4 days</td>
<td>Mon 8/12/13</td>
<td>Thu 8/15/13</td>
</tr>
<tr>
<td>250</td>
<td>RMS/FBR 30-Day Performance and Reliability Test</td>
<td>78 days</td>
<td>Tue 8/13/13</td>
<td>Thu 11/28/13</td>
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<tr>
<td>251</td>
<td>Execute RMS / FBR 30 Day Performance and Reliability Test</td>
<td>24 days</td>
<td>Tue 8/13/13</td>
<td>Fri 9/13/13</td>
</tr>
<tr>
<td>252</td>
<td>Bi for RMS Prep and Install</td>
<td>5 days</td>
<td>Mon 9/25/13</td>
<td>Fri 9/27/13</td>
</tr>
<tr>
<td>254</td>
<td>Bi Initial RMS Consultation (Pre Implementation Workshop - IPST6006)</td>
<td>4 days</td>
<td>Mon 10/7/13</td>
<td>Thu 10/10/13</td>
</tr>
<tr>
<td>255</td>
<td>Bi for RMS SysAdmin Training (IPST6005)</td>
<td>4 days</td>
<td>Mon 10/14/13</td>
<td>Thu 10/17/13</td>
</tr>
<tr>
<td>256</td>
<td>Bi for RMS User Training (IPST6004)</td>
<td>4 days</td>
<td>Mon 10/21/13</td>
<td>Thu 10/24/13</td>
</tr>
<tr>
<td>257</td>
<td>Bi Reports RMS Consultation (Post Implementation Workshop - IPST6007)</td>
<td>4 days</td>
<td>Mon 11/25/13</td>
<td>Thu 11/28/13</td>
</tr>
</tbody>
</table>

**Notes:**
- Duration for some tasks includes additional activities not explicitly listed in the table.
- Some tasks are marked as "Inactive Summary" indicating they are not active or completed.
- "Duration-only" and "Progress" are used to highlight specific aspects of the project timeline.

**Intergraph Corporation Date:** Tue 2/21/12
SOW Attachment B: Project Deliverable Sign-off Form

PROJECT DELIVERABLE SIGN OFF FORM

CUSTOMER NAME, ANYWHERE USA – PROJECT NAME

<table>
<thead>
<tr>
<th>Submission Date:</th>
<th>Month/Day/Year</th>
<th>Sign-Off Target Date:</th>
<th>Month/Day/Year</th>
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<tbody>
<tr>
<td>Submitted By:</td>
<td>Intergraph Contact Name</td>
<td>Submitted To:</td>
<td>Customer Contact Name</td>
</tr>
<tr>
<td>Customer Contract #:</td>
<td>Customer Contract Number</td>
<td>Customer/Project #:</td>
<td>Intergraph Project Number</td>
</tr>
</tbody>
</table>

TYPE OF DELIVERABLE

☐ SOW Tasks  ☐ Payments  ☐ Plans/Designs  ☐ Training  ☐

DELIVERABLE INFORMATION

DETERMINABLE DESCRIPTION
THIS SECTION DESCRIBES THE DELIVERABLE

With the deliverable described above complete, the Customer shall have five (5) working days to either sign-off that the deliverable has been met or state in writing to Intergraph the reason the deliverable has not been met.

Sign-off of the deliverable shall be based solely upon the deliverable meeting the requirements stated in the Agreement between Intergraph and CUSTOMER NAME dated Month/Day/Year and shall be indicated by the Customer signing the Project Deliverable Sign-off Form. If the Customer does not provide such sign-off or rejection within the five day working period then the deliverable will be deemed to have been signed off.

The signature below acknowledges that the deliverable described in the Agreement and listed above meets all of the appropriate criteria and supersedes all prior requirements for this item.

Customer acknowledges completion of this payment milestone according to the Contract Payment Milestone Schedule and provides authorization to invoice this milestone.

Authorized Customer Representative
Customer Contact Name

__________________________  ______________________
SIGNATURE DATE
Statement of Work

Security, Government and Infrastructure, a Division of Intergraph Corporation

Maricopa County, AZ

Intergraph Corporation

Statement of Work

For

CAD/Mobile, Law RMS/FBR Implementation

February 21, 2012
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STATEMENT OF WORK INTRODUCTION

Intergraph has contracted with Maricopa County ("Customer") to provide the products and services identified in the Pricing Detail and Deliverables Summary in Exhibit A of the Maricopa County Arizona Agreement ("Agreement") and which are necessary to implement an integrated public safety system for the Customer.

The term “System,” refers to the proposed computer system that Intergraph will provide the Customer, and includes all hardware, system software, application software, interfaces, ancillary systems, and services listed in Exhibit A of the Agreement. The System is comprised of two primary subsystems:

- Computer Aided Dispatch (CAD) and Mobile for Public Safety (MPS) Subsystem, collectively referred to herein as CAD/MPS
- Law Enforcement Records Management (LRMS) and Automated Field Reporting (FBR) Subsystem, collectively referred to herein as LRMS/FBR

The software provided by Intergraph for this System will be the latest certified version available at the time of initial software installation, and will be the major product version used for production operations cutover. If a major software release occurs during project implementation, this software release will not be included in the project. Intergraph generally releases one major features version of the software every 12 to 18 months. Major features releases generally are accompanied by multiple minor point releases on a quarterly basis. During project implementation and prior to “live” production operations, if the inclusion of a point release is mutually determined by both the Customer and Intergraph to be required to meet system requirements, that point release version may be installed and implemented.

The Statement of Work herein guides the primary activities and responsibilities for the implementation of the System. It documents project implementation requirements, identifies each major task within the implementation process, sets expectations for each party and identifies the criteria by which a task will be considered complete. The Statement of Work herein is tailored to accommodate the Customer’s-specific requirements. Intergraph will implement the CAD/MPS and LRMS/FBR subsystems concurrently, each following a separate set of tasks as detailed in this Statement of Work and the Project Schedule in Attachment A. Several tasks, however, will overlap at the beginning and the end of the project. These tasks are identified as System Level Project tasks in the Statement of Work.

The Statement of Work includes the following Attachments:

- Attachment A – Draft Project Schedule
- Attachment B – Project Deliverable Sign-off Form
- Attachment C – CAD-LRMS Configuration Diagram
- Attachment D – Interface Descriptions
- Attachment E – Training Curriculum
- Attachment F – Standard Hardware Configuration Guide
- Attachment G – Acceptance Test Plan
- Attachment H – Contract Clarifications
- Attachment I – Customer Support Center

The remainder of this section details System Level Project Assumptions that bear on the project cost, schedule and scope, Project Team Composition, and Project Management Responsibilities.
**PROJECT ASSUMPTIONS**

The following list includes Intergraph’s assumptions about the Pricing Detail and Deliverables Summary in Exhibit A of the Agreement. Changes in any of the assumptions will affect the scope, schedule, and/or cost of the project.

- CAD will be implemented in a SQL environment; LRMS will be implemented in an Oracle environment
- All “end-user” training will follow a Train-the-Trainer model
- Training will take place during normal business hours, which is typically from 8:00 am - 5:00 pm, and will not exceed eight (8) hours per 24-hour period
- Training will be provided per the curriculum described in Attachment E
- Customer is responsible for the WAN/LAN
- Customer is responsible for the wireless infrastructure
- Customer’s wireless infrastructure is the same for all agencies and meets minimum bandwidth requirements as stated in the Standard Hardware Configuration Guide in Attachment F
- Customer is responsible for the purchase, installation, and testing of the client/mobile hardware
- All server hardware will conform to the Standard Hardware Configuration Guide in Attachment F
- Customer is responsible for the purchase, installation, and testing of all physical hardware
- Intergraph and the Customer will be responsible for testing the final system configuration as documented in the Configuration Diagram as per Attachment C
- The operation and availability of the external systems or third-party software is the responsibility of the Customer and necessary for the success of project
- Intergraph will install MPS client software on ten (10) mobile devices. Intergraph will train the Customer’s System Administrator on how to install the client applications on the remaining MPS clients, per the license purchased for each
- Intergraph will install LRMS/FBR-related client software on ten (10) workstations. Intergraph will train the Customer’s System Administrator on how to install the client applications on the remaining LRMS/FBR-related workstations, per the licenses purchased for each
- Customer is responsible for any hardware and third-party software necessary for implementing the systems, beyond that provided by Intergraph per the contract agreement
- Customer is responsible for maintaining in good working order the third-party systems that it operates and that interface with Intergraph software as part of this project
- The Intergraph Implementation teams must have access to all servers and workstations that are applicable to the CAD and LRMS project. This includes having a Domain Login with local administrative privileges to remove/install software, have access to registries, set scheduled tasks, and have remote access to applicable desktops
- During system implementation, unrestricted VPN access is required for Intergraph developers and implementers who will need to have multiple resources connecting at the same time. This requirement enables rapid development and testing of those interfaces that Intergraph cannot test in-house, resolution of system configuration issues, and troubleshooting capabilities. Intergraph will also require external VPN access while on site to access various Intergraph resource libraries. After system cutover, Intergraph will VPN into the live system only at the Customer’s request and will follow all of the Customer’s required VPN access procedures
CUSTOMER OF PROJECT TEAM STRUCTURE

The Customer is responsible for providing resources to staff the Core Project Teams required for a successful System implementation. The Core Project Teams Roles and Responsibilities are described in the following sections.

Core Team Roles and Responsibilities:

Core Project Teams must consist of designated agency personnel with the various skill sets, knowledge, and backgrounds required to implement the new CAD/Mobile and LRMS/FBR systems. The following list identifies the suggested Core Project Team roles and corresponding responsibilities.

- **Project Manager** – responsible for the day-to-day coordination of project activities with the Customer’s Core Team and Intergraph
- **Departmental Sponsors** – responsible for making decisions on recommended business process changes and other related items
- **System Administrator Personnel** – responsible for all system administration and configuration responsibilities related to the new system, all system interfaces, and the mobile system
- **GIS Administrator** – responsible for providing the Intergraph Map Lead with mapping updates during the course of the project and for installing map updates after system implementation
- **CAD/RMS Database Administration Personnel** – responsible for creating I/CAD data records, as well as for monitoring and tuning the RMS database to meet Customer needs
- **Training Personnel** – responsible for training other agency personnel
- **Subject Matter Experts** (i.e. Dispatch supervisor, Records supervisor) – responsible for representing end-users’ needs

Core CAD Project Team

The Customer’s Core CAD/MPS Project Team will consist of the following personnel:

- **Project Management**: Winbourne Consulting will be representing Maricopa County as the Project Manager for this implementation
- **Applications Development Manager**
- **Telecommunications Manager**
- **Business Analysts** (1 to function as Project Lead for MCSO)
- **GIS Programmer/Analysts**
- **GIS Technician**
- **Radio Support Analyst**
- **MDC Analysts**
- **Database Administrator**
- **Deputies**
Core LRMS/FBR Project Team

The Customer's Core LRMS/FBR Project Team will consist of the following personnel:

- Project Management: Winbourne Consulting will be representing Maricopa County as the Project Manager for this implementation
- Applications Development Manager
- Telecommunications Manager
- Business Analysts (1 to function as Project Lead for MCSO)
- GIS Programmer/Analyst
- MDC Analysts
- Database Administrator
- Deputies

Note: Other Subject Matter Experts can be included in specific meetings pertaining to their functional areas (i.e., Internal Affairs, Risk Management, etc.).

PROJECT MANAGEMENT GUIDELINES

In the interest of managing project scope, schedule, and cost, all parties agree to adhere to the following:

Project Task Completion Sign-Off Procedure

At the completion of each Task in this Statement of Work, the Intergraph Project Manager and the Customer Project Manager will jointly sign the Project Deliverable Sign-Off Form. A template of this form is included in Attachment B.

General Project Management Responsibilities

Project management occurs throughout the project and is a component of every task. Overall project management activities for both Intergraph and the Customer are listed here for reference.

Intergraph's Project Management Team responsibilities include the following:

- Maintaining project communications with the Subcontractor Project Manager and the Customer's Project Manager
- Managing the efforts of the Intergraph staff and coordinating Intergraph's activities with the Customer's Project Manager
- Managing the efforts of other subcontractors utilized by Intergraph in the performance of the project
- Conducting monthly on-site status meetings with the Customer’s Project Manager
- Conducting weekly project review meetings with the Customer's Project Manager via telephone conference calls
- Responding to issues raised by the Customer’s Project Managers within ten (10) business days
Preparing and submitting monthly status reports, which include the accomplishments of the previous month, planned activities, and an updated project schedule in Microsoft Project

Preparing and submitting project Change Orders to the Customer’s Project Manager as necessary

Ensuring Intergraph personnel have ample time, resources, and expertise to carry out their respective tasks and responsibilities

Customer Project Manager Responsibilities include the following:

- Maintaining project communications with the Intergraph Project Manager
- Managing the efforts of Customer staff and coordinating Customer activities with the Intergraph Project Manager
- Providing input to Intergraph for creation of the monthly status reports
- Ensuring that Customer personnel have ample time, resources, and expertise to carry out their respective tasks and responsibilities
- Participating in the status meeting with the Intergraph Project Manager on a monthly basis or as may otherwise be reasonably required to discuss project status
- Participating in the weekly project review meetings with the Intergraph Project Manager via telephone conference calls
- Providing responses to issues raised by the Intergraph Project Manager within ten (10) business days
- Serving as liaison with all Customer-provided third-party vendors and associated systems
- Ensuring that acceptable Change Orders are approved by authorized signature(s)
- Ensuring timely payment of invoices
- Ensuring Intergraph has access to server and network equipment and work areas on a 24x7 basis, with pre-authorization for off-hours
- Providing workspace for Intergraph personnel as reasonably requested

**STATEMENT OF WORK TASK FORMAT**

Each task identified in the Statement of Work includes the Task Description, Intergraph/Customer Participants, Prerequisites, Deliverables, Intergraph/Customer Responsibilities, and Completion Criteria. All parties recognize that the tasks defined in the SOW may not be listed chronologically, and that the actual project implementation tasks and time lines will follow the mutually agreed to Project Schedule, unless otherwise noted.
INITIAL SYSTEM LEVEL PROJECT TASKS

The following four (4) tasks occur at the system level and include the CAD/MPS and LRMS/FBR Project Teams.

1. PROJECT KICK-OFF MEETING

The objective of this task is to ensure that all project assumptions are valid and all requirements are understood prior to beginning any significant work. Cost adjustments may apply if assumptions are not correct, or requirements have evolved, per the agreed upon Change Order process. A meeting for project kick-off will be held on-site after the SOW has been executed. During this meeting, the following topics will be covered:

- **Logistics:**
  - Facility tour, conducted by the Customer Project Manager
  - Facility access and security requirements (during and after normal business hours)
  - Work space requirements for Intergraph personnel while on-site

- **Project Organization, Roles and Responsibilities**
  - Project team members and contact information
  - Communication plan
  - Project overview (a high-level review of the SOW and its Attachments, as well as the Contract and its Exhibits)
  - High-level review of product and project deliverables

- **Known project risks**

Additionally, Intergraph will provide the Customer with questionnaires to gather information regarding workflows in areas affected by the implementation of the new System.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- LRMS Lead/Business Analyst
- Project Manager(s)

**Customer Team Participation:**
- CAD Core Team
- LRMS Core Team
- Project Manager

**Prerequisites:**
- Contract Signature and/or PO/Notice to Proceed (if applicable)
- Distribution of Statement of Work to the Project Team
**Deliverables:**
- Intergraph on-site and remote services
- Workflow questionnaires
- Project kick-off meeting notes

**Intergraph Responsibilities:**
- Review the project organization, roles, and responsibilities with the Customer
- Conduct the Project Overview including a review of the Statement of Work to answer any outstanding questions and verify all aspects of the Project approach, per the topics listed above
- Issue Business Process Questionnaires and review the expectations regarding completing the Questionnaires
- Issue Map Specification Document
- Work with the Customer to identify and document any potential project risks
- Provide meeting minutes, documented risks, and action items that affect project schedule, resources, and/or SOW
- Inform Customer of VPN requirements for project implementation and continued system maintenance
- Ensure technical accuracy of the Interface Descriptions in Attachment D

**Customer Responsibilities:**
- Review the SOW and work with Intergraph to verify the project approach
- Provide location and logistical support for project planning meeting
- Provide Subject Matter Experts and any other resources as recommended by the Customer and Intergraph Project Managers
- Begin completing the Business Process Questionnaires
- Provide Intergraph with VPN access to the Customer, as appropriate, for this project and continued software maintenance
- Designate and prepare workspace for Intergraph and Subcontractor personnel
- Provide a point of contact for vendors for Customer hardware and software components with which the Intergraph deliverables will interface
- To the extent that it is able to do so, introduce Intergraph to third parties, including other vendors, state and local agencies, that control products and/or databases with which Intergraph products will be interfaced

**Completion Criteria:**
This task is considered complete at the conclusion of the on-site Project Kick-off meeting and upon delivery of the meeting minutes to the Customer.
2. **PROJECT SCHEDULE REVIEW**

The initial Project Schedule is in Attachment A to this Statement of Work. The Project Schedule identifies all tasks to be completed by Intergraph and the Customer during the lifecycle of the project, the responsible party for each task and the project milestones.

During this task, the Intergraph and Customer Project Managers, as well as the Customer Department Project Sponsors, Intergraph resource allocation or scheduling personnel, and other Customer, Intergraph personnel who can assist in scheduling decisions, will meet to review the schedule. Intergraph and the Customer will verify the availability of resources to complete scheduled tasks and adjust the schedule to accommodate any known variations in availability. The Intergraph Project Manager will update the schedule. It is anticipated that Intergraph will have a final project schedule ready for review within ten (10) days of completing the Project Schedule Review meeting.

The Project Schedule will be updated as necessary over the course of the Project. All changes to the schedule will be mutually agreed upon and, if required, documented via the mutually agreed upon Change Order process. Any schedule changes that occur will be a part of the monthly Project Status Report provided by the Intergraph Project Manager.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- LRMS Lead/Business Analyst
- Project Manager(s)

**Customer Team Participation:**
- Department Project Sponsors
- Project Manager

**Prerequisites:**
- Contract signing

**Deliverables:**
- Intergraph on-site services
- Completed Project Schedule

**Intergraph/RMS Subcontractor Responsibilities:**
- Present and discuss Project Schedule
- Update Project Schedule

**Customer Responsibilities:**
- Provide input to the Project Schedule
- Commit resources to be available when required per the Project Schedule
- Approve the final Project Schedule within ten (10) business days of submittal by Intergraph
Completion Criteria:
This task is considered complete upon Customer approval of the final Project Schedule. To accommodate unanticipated Task durations, changes in resource availability and Change Orders, updates to the Project Schedule will continue until project close.

3. SYSTEM HARDWARE ORDERING

The objective of this task is to complete the purchase orders for hardware and operating system server software required for the CAD/MPS and LRMS/FBR System. Based on the Pricing Detail and Deliverables Summary in Exhibit A and the Standard Hardware Configuration Guide in Attachment F, and the CAD-LRMS Configuration Diagram in Attachment C to this Statement of Work, Intergraph and the Customer will agree upon the hardware and software that the Customer will purchase. The Customer will provide Intergraph with copies of the purchase requisition for hardware and operating system software. When the Intergraph agrees that the purchase requisition is accurate, the Customer will order the hardware and operating system software for which they are responsible. Intergraph will fulfill its responsibilities for this task off-site.

As part of this task, Intergraph will facilitate a discussion with the Customer regarding the Customer’s hardware and network environment. The Customer will prepare a Site Preparation Plan. The Customer will also need to order any additional hardware and system software for which it is responsible, and which it will need to establish the System’s virtual servers.

Intergraph Team Participation:
- CAD Lead/Business Analyst
- LRMS Lead/Business Analyst
- Project Manager(s)

Customer Team Participation:
- CAD Core Team
- LRMS Core Team
- Project Manager

Prerequisites:
- Project Planning Meeting

Deliverables:
- Customer-specific Site Preparation Plan
- Final hardware and operating system server software purchase requisitions

Intergraph Responsibilities:
- Review Site Preparation Plan, Standard Hardware Configuration Guide, CAD-LRMS Configuration Diagram, Pricing Detail and Deliverables Summary, and hardware purchase requisition with the Customer
- Approve the purchase requisition for hardware and operating system server software
Customer Responsibilities:

- Review CAD-LRMS Configuration Diagram, Standard Hardware Configuration Guide, and hardware requisition
- Prepare the hardware purchase requisition and provide to Intergraph for review
- Develop Site Preparation Plan specific to the Customer location
- Place order for CAD and LRMS hardware and operating system server software to be shipped directly to the Customer. Order any additional System hardware and operating software for which the Customer is responsible.
- Confirm the Customer location for delivery of hardware and operating system server software

Completion Criteria:

This task is considered complete after Intergraph has delivered the required documents to the Customer, both the Customer and Intergraph have agreed upon the hardware and operating system server software that is to be ordered and the Customer has placed the order for the System hardware and operating system server software.

4. System Hardware Delivery and Installation

The objectives of this task are for the Customer to install all System hardware, and network components, and for Intergraph to install CAD software to prepare for initial training and configuration tasks. Before the hardware is delivered, the Customer will review the locations where the Customer is housing the servers to verify that the sites are ready for hardware installation. The Customer will inventory the system hardware upon its delivery before installing the hardware. Before Intergraph can install the CAD software, the Customer will need to provide Intergraph with IP addresses and node names for hardware equipment. The Customer will install the hardware and operating system server software and any other components for which it is responsible. Intergraph will install the COTS CAD application software.

The Customer will confirm that the hardware was delivered and installed in accordance with the following:

- Attachment C – CAD-LRMS Hardware Configuration Diagram
- Attachment F – Standard Hardware Configuration Guide
- Exhibit A (Agreement) – Pricing Detail and Deliverables Summary

Intergraph will update the CAD-LRMS Hardware Configuration Diagram to depict as-built hardware and server software information.

Intergraph/RMS Subcontractor Team Participation:

- Project Manager(s)
- CAD Hardware Specialist
- LRMS Hardware Specialist
Customer Team Participation:
- Project Manager
- System Administrator
- Network Administrator
- Hardware Specialist

Prerequisites:
- Completion of System Hardware Ordering Task
- Delivery of System hardware
- Completion of Site Preparation Plan specific to Customer

Deliverables:
- Intergraph on-site installation services
- Server hardware and Operating System installed and servers configured in accordance with CAD-LRMS Configuration Diagram and the Standard Hardware Configuration Guide
- Updated CAD-LRMS Configuration Diagram depicting as-built hardware and server software information
- Installation of COTS CAD application software

Intergraph responsibilities:
- Install the COTS CAD application software
- Update the CAD-LRMS Configuration Diagram to depict as-built hardware and server software information

Customer responsibilities:
- Confirm the Customer site(s) is/are ready for hardware installation
- Confirm that the hardware and operating system delivered is accurate per the Customer-issued purchase orders
- Supply all Microsoft Client Access Licenses (CALs) and maintain compliancy with Microsoft’s licensing policies for Client Access Licenses
- Take ownership of hardware received
- Inventory hardware upon receipt
- House hardware until installation
- Confirm hardware delivery location meets environmental requirements
- Provide the network and wireless infrastructure, ensuring that the network is ready, and power and serial port requirements have been met
- Install the Customer-supplied server hardware
- Install the Customer-supplied Operating System software
- Provide IP addresses and node names to Intergraph
Ensure the System Administrator and Network Administrator are available for the duration of the hardware and server software installation

Provide electrician and data technician support necessary to facilitate equipment movement and installation activities as necessary to comply with Customer site-specific regulations and union guidelines

Install additional products not purchased under this contract, such as third-party backup software and telephony software

Configure the Active Directory (Native Mode) domain, if desired (note that Intergraph recommends a separate server be used as a domain controller)

Supply any required conduit or cable raceways

Install any network devices such as switches or hubs

Provide two twist-lock receptacles per server rack; receptacles for primary and secondary CAD servers should be on separate circuits of the UPS

**Completion Criteria:**

This task is considered complete when Customer has installed the server hardware and operating system software as defined in the CAD-LRMS Configuration Diagram, Attachment C and the Standard Hardware Configuration Guide, Attachment F; Intergraph has installed the COTS CAD application in the production environment; and the Customer’s Project Manager has verified the hardware and CAD application software installation CAD Implementation Tasks

Intergraph segments implementation activities into four (4) implementation phases, described as follows:

- **Planning and Initiating Phase:** Tasks during the preliminary phase are designed to confirm CAD/MPS subsystem and interface requirements, clarify the Customer's expectations with respect to subsystem deliverables and clarify Intergraph's understanding of Customer workflows

- **Staging Phase:** Tasks undertaken during the Staging Phase result in a functional, although not fully configured, CAD/MPS subsystem that uses the Customer's operational and mapping data. The Customer will begin to learn basic system administration in preparation for site-specific system configuration during the Configuration Phase

- **Configuration Phase:** Tasks during the Configuration Phase result in a fully configured CAD/MPS subsystem and include both interface installation and data conversion tasks that prepare for the final, full data conversion

- **Deployment Phase:** Tasks during the Deployment Phase include final map building and processing, final data conversion, end-user training, system testing and system fine-tuning

At the conclusion of each phase, Intergraph will conduct a Technical Health Check to ensure that all project tasks within the phase have been completed and the project is ready to transition into the next phase of implementation. If there are outstanding items, the Project Managers will mutually develop a plan to complete those items. The plan will include the potential impact of the outstanding items on the Project Schedule.
**Planning and Initiating Phase Tasks**

5. **CAD and Mobile Receive & Process Map Data for Initial Map Build (#1)**

Prior to Intergraph beginning this task, the Customer must provide Intergraph with map data compiled per the Map Specification Document issued in Task 1. During this task, Intergraph will analyze the initial set of Customer-supplied map data, provide the Customer with feedback on ways to improve the quality of the data, and build an initial CAD map dataset for use in the initial system build activities. Intergraph will review the Customer-supplied map source data's suitability for processing into the Intergraph CAD map, focusing on street centerlines and point addresses. Intergraph will also analyze topologic validity, attribution values, address parsing, aliasing and other critical map features. Intergraph will summarize its analysis in a Map Data Analysis Report that identifies potential data issues and provides recommendations for schema changes and data pre-processing.

Intergraph will also generate CAD-ready map data from the Customer-supplied map source data, using standard feature types, level structures and color assignments. Intergraph will create ESZ polygons if available; otherwise, it will generate a single polygon for the entire area. In most cases, the analysis of the map data and the initial CAD map dataset build occur over a 2-week period, with the initial build using the initial set of data before any edits are applied.

**Intergraph Team Participation:**
- Mapping Lead
- CAD Lead

**Customer Team Participation:**
- GIS/Map Administrator

**Prerequisites:**
- Customer provision of an initial set of map data to Intergraph
- Project Planning Meeting
- Completion of Project Schedule Review

**Deliverables:**
- Intergraph on-site services
- Map Data Analysis Report that includes shapefiles and identifies problems with the Customer-supplied source data
- Initial CAD Map build (populated database tables, map display file, routing files and deployment polygon files)
Intergraph responsibilities:

- Review Customer supplied source data
- Provide Map Data Analysis Report
- Generate CAD-ready map data from Customer supplied map source data
- Install the initial CAD map build on the Customer production CAD system
- Deliver the CAD Map Analysis Report

Customer responsibilities:

- Ensure appropriate Customer personnel are available, as needed, to assist Intergraph with this task
- Supply Intergraph with source data in a format compatible with the GeoMedia environment (e.g. shape-files) at least one full week prior to scheduled analysis
- Provide information on the source data schema to aid in mapping attribution to the CAD Map schema
- Provide feedback to the Intergraph Mapping Lead on the CAD map display
- Review and approve the Map Data Analysis Report
- Correct critical data issues reported by the Data Analysis process prior to the Map Basics Workshop

Completion Criteria:

This task is considered complete upon delivery of the Map Data Analysis Report and the initial CAD map build on the Customer’s production CAD System.

6. Map Fundamentals Workshop

During this 3-day Mapping Workshop, Intergraph and the Customer’s Map Teams will start exploring issues related to the map source data and its conversion to the CAD map dataset. Intergraph will also present potential workflow processes and options, including options for the Location Verification process, as well as use the data from the initial map build to provide an extended demonstration of the GeoMedia Pro and I/MapEditor applications. Intergraph will provide the Customer with a self-paced training course to learn the GeoMedia Pro. The Customer will need to complete the self-paced training of the GeoMedia Pro by the Map Basics Workshop IPST8001 Task.

During this on-site workshop, Intergraph and the Customer will discuss:

- The CAD map data requirements, as well as the results of the Map Data Analysis Report that includes Intergraph’s recommendations on map data corrections and modifications
- The CAD map data schema and its relationship to the Customer’s source data
- Other issues related to the source map data and its use for Location Verification in CAD

At the conclusion of the workshop, Intergraph will provide the Customer with a Map Data and Workflow Recommendations Report summarizing data schema mapping and recommendations made by Intergraph during the workshop.
Intergraph Team Participation:

- Mapping Lead
- Project Manager

Customer Team Participation:

- GIS/Map Administrator
- Departmental Mapping Subject Matter Experts
- Project Manager

Prerequisites:

- Completion of the Map Data Analysis Report and Initial Map Build

Deliverables:

- Intergraph on-site training services for three (3) day Mapping Workshop
- Training Materials
- Map Data and Workflow Recommendations Report

Intergraph responsibilities:

- Conduct the three (3) day Mapping Fundamentals Workshop
- Review results of the Map Data Analysis Report and recommendations on data correction and augmentation prior to the Mapping Workshop
- Review the CAD map data schema and work with the Customer to determine how this relates to the supplied source data
- Provide an overview of the Location Verification process in CAD
- Discuss potential workflow processes and make recommendations based on these and the Customer source data
- Provide follow-up Map Data and Workflow Recommendations Report

Customer responsibilities:

- Ensure Customer personnel who will be tasked with supplying, correcting, and maintaining the map source data, as well as those tasked with processing the Customer map data into the CAD map format; attend the 3-day Mapping Workshop
- Provide meeting facilities, including overhead projector
- Provide a workstation installed with the previously provided source data to aid in discussions regarding data schema and attribute structure

Completion Criteria:

The task is considered complete at the conclusion of the 3-day Mapping Workshop and upon the delivery of the Map Data and Workflow Recommendations Report to the Customer.
7. **Interface Control Documentation (ICD) Review and Submittal**

The Interface Descriptions in Attachment D provide a high-level overview of the interfaces that Intergraph will develop as part of the System. The goal of this task is to identify and obtain the specific information needed to configure the interfaces and develop an Interface Control Document (ICD) for each interface. The Customer will provide a point of contact for all Customer hardware and software components with which the Intergraph deliverables will interface. The Customer will also, to the extent that it can, introduce Intergraph to third parties, including other vendors, state agencies, and local agencies that control products and/or databases with which Intergraph products are to be interfaced. Intergraph will research interface requirements and gather any available documentation that can clarify data schema, protocols and query specifications. Intergraph will develop draft ICDs and provide them to the Customer for review. The Customer will review the functional content of the ICDs and provide feedback to Intergraph. After receiving feedback from the Customer on the draft ICDs, Intergraph will finalize the ICDs and deliver the final documents to the Customer for approval of the functional content of the ICDs. Intergraph is responsible for ensuring the technical accuracy of the ICDs.

**Intergraph Team Participation:**
- Project Manager
- CAD Interface Lead

**Customer Team Participation:**
- Project Manager
- Subject Matter Experts

**Prerequisites:**
- Project Kick-off Meeting and Data Gathering
- Customer to provide Intergraph with available interface-related documentation

**Deliverables:**
- Intergraph remote services
- Interface Control Documentation

**Intergraph responsibilities:**
- Lead the interface requirements gathering process, tracking outstanding items requiring resolution
- Convene with Customer and third party points of contacts to gather information required to develop ICDs
- Ensure that third party points of contacts are appropriate sources of information necessary to develop ICDs
- Mutually agree with the third party vendors on the functional and technical interface requirements.
- Gather all commercially available interface data detailed schema, protocols, and query specifications, as needed
- Prepare draft ICDs and provide to Customer for feedback
- Incorporate Customer feedback into draft ICDs
- Finalize Interface Control Documents for Customer review and approval
**Customer responsibilities:**

- Provide points of contact who are knowledgeable of the workflow and data requirements for each Customer hardware and software component with which Intergraph deliverables will interface
- To the extent that it has access to the information, provide Intergraph with schema, protocols, and query specifications for Customer hardware and software components with which Intergraph deliverables will interface
- Introduce Intergraph to a primary point of contact for third parties, including other vendors, state agencies, and local agencies that control products and/or databases with which Intergraph products are to be interfaced
- Provide any additional hardware or software that a third party requires for an interface with the third party system to operate properly.
- Respond to Intergraph questions and requests for information in a timely manner
- Ensure that design decisions are made conclusively and in a timely manner
- Review draft ICDs and provide Intergraph feedback on any necessary changes or updates within ten (10) business days of receipt
- Review and approve the functional content of the final ICDs

**Completion Criteria:**

This task is considered complete when the Customer has reviewed and approved the functional content of the finalized ICDs.

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**8. CAD INTERFACE DEVELOPMENT**

During this task, Intergraph will develop the CAD/MPS interfaces per the approved ICDs.

**Intergraph Team Participation:**

- CAD Lead
- Interface Lead

**Customer Team Participation:**

- N/A

**Prerequisites:**

- Customer review and approval of the Interface Control Documents

**Deliverables:**

- Interfaces developed per the approved ICDs

**Intergraph responsibilities:**

- Develop interfaces per the approved ICDs

**Customer responsibilities:**
9. **Technical Health Check**

This task allows the Intergraph CAD Technical Lead and the Intergraph Project Manager to coordinate with the Customer’s CAD Core Team to ensure that all Planning and Initiating Phase project tasks, with the exception of Interface Development Task, have been completed and the project is ready to transition to the Staging Phase of implementation. Intergraph’s CAD Technical Lead and Project Manager will meet on-site with the Customer’s Project Manager and Core CAD Project Team to review project tasks completed to-date. If there are outstanding Planning and Initiating Phase items, the Intergraph and Customer Project Managers will mutually develop a plan to complete those items. The plan will include the potential impact of the outstanding items on the project schedule.

**Intergraph Team Participation:**
- CAD Lead
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Project Manager

**Prerequisites:**
- Completion of Planning and Initiating Phase tasks

**Deliverables:**
- Meeting notes
- Detailed status report of any outstanding items
- Plan to complete outstanding Planning and Initiating Phase tasks (if needed)

**Intergraph responsibilities:**
- Schedule meeting between Intergraph and Customer
- Facilitate Technical Health Check meeting
- Provide meeting notes summarizing the status of project tasks
- Provide plan to complete outstanding Planning and Initiating Phase tasks (if needed)

**Customer responsibilities:**
- Ensure Core CAD Project Team attends Technical Health Check meeting
- Work with Intergraph Project Manager to develop plan to complete outstanding Planning and Initiating
Phase tasks (if needed)

**Completion Criteria:**
This task is considered complete when all tasks within the Planning and Initiating Phase have been completed and/or a plan to complete outstanding project tasks has been approved by the Customer. All parties will mutually agree the project should continue to the next phase.

### STAGING PHASE

**10. CAD SYSTEM BUILD ON PRODUCTION ENVIRONMENT**

The objective of this task is to provide the Customer with a basic CAD system that Intergraph can use for subsequent configuration and training tasks. To prepare for this task, the Customer will need to collect the data required to configure the CAD application to reflect its data and workflows. At least a month before starting this task, Intergraph will provide the Customer with Configuration forms that will help the Customer gather this information.

Over a 3-week period, Intergraph will provide an in-depth review of the I/CAD application to familiarize the Core CAD Project Team with CAD features, including event processing, dispatching, map utilization and inquiries. Intergraph will also begin to build the production CAD system, entering some Customer-specific CAD configuration data as it walks the CAD Project Team through the system features.

During the first week, Intergraph will review with the Customer how the CAD database software is installed and set up, CAD Database Management (CADDBM) functionality and the CAD database table structure. Intergraph will also begin entering CAD configuration data provided by the Customer. During this week, the Customer should be prepared to provide Intergraph with the following types of data:

- Agency
- Number
- Event type
- Unit
- Vehicle
- Stations

System review and configuration will continue during the second week, when the Customer should be prepared to provide Intergraph with the following types of data:

- Deployment and recommendation planning
- ESZs
- Beats
- Dispatch groups
- Deployment plans
- Response requirements
During the third week, Intergraph will finish the CAD System data build, and begin the department specific configuration. It will address more advanced CAD system functionality, including Department-specific and advanced functions. By the end of this week, the CAD Project Team will have an in-depth understanding of CAD and be able to test configuration data and establish scenarios for upcoming configuration work.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager
- IT Resources

**Prerequisites:**
- Completion of Planning and Initiating Phase and Technical Health Check Task, with the exception of Interface Development
- Customer completion of Configuration Forms

**Deliverables:**
- On-site services - Conduct three (3) collaborative System Build sessions

**Intergraph responsibilities:**
- Provide services for the initial I/CAD System database build of the production CAD and interface servers
- Install I/CAD base software to support a customer agency configuration (Law Enforcement, Fire, and/or EMS)
- Work in collaboration with the Customer’s CAD Core Team to load and/or import site specific data into the I/CAD System
- Install preliminary I/CAD System map
- Install I/CAD System client workstations to support system configuration and training tasks

**Customer responsibilities:**
- Ensure appropriate Customer personnel are available for the System Build sessions
- Provide remote access
- Observe installation and begin to develop an in-depth understanding the I/CAD System
- Participate fully during joint system build-out sessions
- Gather data required to populate system tables as required by the I/CAD System

**Completion Criteria:**

This task is considered complete at the conclusion of the three (3) collaborative System Build sessions and when Intergraph has installed and configured the I/CAD System database servers and workstations with Customer-specific data. This task will not include the I/CAD System interfaces.

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**11. MAP BASICS WORKSHOP (IPST8001)**

This task provides four (4) days of on-site training in basic mapping administration with the objective of enabling the Customer to be self-sufficient in map management. The Maps Basic Workshop will introduce participants to the GeoMedia Pro and I/MapEditor applications that the Customer will use in the CAD Map processing workflow. Specifically, the workshop will focus on:

- Evaluating source data
- Creating and maintaining polygon data
- Creating the published map file, including feature symbology, labeling, auto zoom levels, etc.
- CAD Map display modification

The class will use the Customer’s most recent dataset in the GeoMedia Pro and I/MapEditor environment, and will conclude with an extended demonstration of the additional I/MapEditor functionality not covered in detail at this stage. Because of the large amount of material that must be covered and the interactive nature of this workshop, class size is limited to four (4) participants and two (2) observers.

At the conclusion of this workshop, the Customer will assume responsibility for creating and maintaining all deployment and other project polygon files. The Customer will have the tools to determine how it wants the map to look and act in the dispatch environment. Further, the Customer will be expected to exercise the knowledge gained in this workshop to develop the data and display configuration information that will be used in subsequent workshops, as well as to analyze and correct the Customer’s source data before submitting it to Intergraph for the next map build.

**Intergraph Team Participation:**

- Mapping Lead
- Project Manager

**Customer Team Participation:**

- GIS/Map Administrator
- Project Manager

**Prerequisites:**

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- Correction of all critical map issues by the Customer identified in the Map Analysis Report
- Map Build #1
- Completion of Map Fundamentals Workshop / Consulting
- Customer completion of self-paced GeoMedia Pro training

**Deliverables:**

- Training services for Map Basic Workshop (IPST8001)
- Training Materials - I/MapEditor Training Guide

**Intergraph responsibilities:**

- Conduct Map Basics Workshop
- Provide temporary training licenses for the GeoMedia Pro and I/MapEditor products for use on additional training workstations during the class

**Customer responsibilities:**

- Supply training facilities, an LCD projector, a projection screen, a whiteboard, workstations, including one full-function workstation per student and one full-function workstation for the instructor, and connectivity between the workstations and the server
- Designate and assign no more than four (4) Customer mapping/GIS personnel to attend the entire course of Map Basics Workshop. Two (2) additional people may attend training as observers/auditors.
- Ensure that all appropriate Customer mapping/GIS personnel attending the class have completed the self-paced GeoMedia Pro training prior to class

**Completion Criteria:**

The task is considered complete at the conclusion of the Map Basics Workshop IPST8001.
12. TECHNICAL HEALTH CHECK

This task allows the Intergraph CAD Technical Lead and the Intergraph Project Manager to coordinate with the Customer’s CAD Core Team to ensure that all Staging Phase project tasks have been completed and the project is ready to transition to the Configuration Phase of implementation. Intergraph’s CAD Technical Lead and Project Manager will meet on-site with the Customer’s Project Manager and Core CAD Project Team to review project tasks completed to-date. If there are outstanding Staging Phase items, the Intergraph and Customer Project Managers will mutually develop a plan to complete those items. The plan will include the potential impact of the outstanding items on the project schedule.

**Intergraph Team Participation:**
- CAD Lead
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Project Manager

**Prerequisites:**
- Successful completion of the Staging Phase project tasks

**Deliverables:**
- Meeting notes
- Detailed status report of any outstanding items
- Plan to complete outstanding Staging Phase tasks (if needed)

**Intergraph responsibilities:**
- Schedule meeting between Intergraph and Customer
- Facilitate Technical Health Check meeting
- Provide meeting notes summarizing the status of project tasks
- Provide plan to complete outstanding Staging Phase tasks (if needed)

**Customer responsibilities:**
- Ensure Core CAD Project Team attends Technical Health Check meeting
- Work with Intergraph Project Manager to develop plan to complete outstanding Staging Phase tasks (if needed)

**Completion Criteria:**
This task is considered complete when all tasks within the Staging Phase have been completed and/or a plan to complete outstanding project tasks has been approved by the Customer. All parties will mutually agree the project should continue to the next phase.
**Configuration Phase**

**13. CAD Interface Product Installation and Configuration**

During this task, Intergraph will be on-site to install and test the interfaces in the Customer's production CAD environment. Although the Customer is expected to participate in Intergraph's internal on-site testing of the interfaces, the Customer will formally test the interface functionality, performance and reliability during Acceptance Testing.

During this task, additional configuration changes can be made based on Customer requests as long as the requests are within the scope of the SOW and conform to the agreed upon ICD. Where appropriate, the Intergraph Interfaces Implementation Lead will provide one-on-one training to the Customer System Administrator on how to make common configuration changes and on general software architecture and operation.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Project Manager
- IT Resources

**Prerequisites:**
- Operation or availability of the external system or third-party software
- Development and approval of ICDs

**Deliverables:**
- Interfaces installed and tested per the approved ICD

**Intergraph responsibilities:**
- Install interfaces in the Customer's production CAD environment
- Test interfaces in accordance with the approved ICDs
- Provide one-on-one instruction on how to make common configuration changes
- Make additional configuration changes to conform with the approved ICDs
Customer responsibilities:

- Provide Subject Matter Expertise to Intergraph as needed
- Verify that physical connectivity has been achieved from Customer's communication server to remote system servers (such as State/NCIC)
- Provide availability and confirm operation of external systems or third-party software
- Provide the following information to Intergraph:
  - IP address for remote databases
  - Socket value for remote systems
  - Operator ID’s (ORIs), terminal mnemonics, etc., as needed by remote systems
- Ensure that the System and Network Administrators are available to work closely with the Intergraph team for the duration of the task

Completion Criteria:

This task is considered complete when each interface is installed and tested in accordance with the mutually agreed ICD.

14. INTERIM MAP BUILD (#2)

Intergraph will remotely create an updated map build based on feedback from the initial map build, the Mapping Workshop and the Map Basics Workshop. The second map build will incorporate any updated or corrected data (based on the initial Map Data Analysis Report), as well as design criteria provided by the Customer following the Map Basics Workshop. There is also the possibility that additional data sources, attributes and features may be added to the map.

At least two (2) weeks prior to this task, the Customer will need to provide Intergraph with a copy of the edited and updated source data, information regarding the desired CAD map display, and any changes the Customer has made to polygon PLY files, feature symbology, or level structure (including modified .map files). Intergraph will run a copy of the updated source data through GeoMedia to validate the data. It will apply any additional attributes required and then use the I/MapEditor application to create a CAD-ready dataset. The CAD-ready dataset will consist of map data tables and files, such as the .map display file and updated .ply file, as applicable. The result of this map build is the creation of a new map dataset ready for installation on the production CAD system.

Once Intergraph has created a new map dataset ready for installation on the Customer’s production CAD system, the Intergraph CAD Implementation team will remotely connect to the Customer’s systems (using VPN, Enexity, or a similar system) and download map dataset to the CAD server. The Map Admin Tool (or other scripts) will be used to copy the map database information into the current CAD system and copy the map files to the appropriate workstations for testing the new map dataset.

Intergraph Team Participation:

- Mapping Lead

Customer Team Participation:

- GIS/Map Administrator
Prerequisites:
- Completion of Map Basics Workshop

Deliverables:
- Intergraph remote services
- Interim CAD Map build (populated database tables, map display file, routing files, and deployment polygon files)
- Updated Map Analysis Report

Intergraph responsibilities:
- Remotely generate CAD-ready map data from Customer-supplied source, incorporating feature types, level structures and color assignments as defined by the Customer
- Generate CAD Map
- Install Map Build #2
- Update Map Analysis Report
- Install interim map build on the production CAD system

Customer responsibilities:
- Provide Subject Matter Expertise to Intergraph as needed
- Correct Customer GIS Data issues
- Ensure that critical data issues reported by the Data Analysis document are corrected prior to submitting dataset for Interim Map Build
- Supply Intergraph with source data, in a format compatible with the GeoMedia environment (e.g. shapefiles, at least two (2) full weeks prior to scheduled map processing)
- Provide information on the desired CAD map display and any changes the Customer has made to polygon PLY files, feature symbology, and level structure (including modified .map files)

Completion Criteria:
The task is considered complete when the interim CAD Map dataset #2 is installed on the Production CAD environment.

15. CAD DATA CONVERSION - INITIAL ANALYSIS AND DATA MAPPING

Intergraph will analyze legacy databases that are candidates for conversion into the new CAD system and produce an initial mapping of legacy data fields to the corresponding fields in the Intergraph CAD database tables.

Intergraph will spend one week on site gathering information about the legacy database(s) that it will convert into the new System. During this period, Intergraph will:
- Interview Customer subject matter experts
- View legacy data in the current system to see where it might fit in the Intergraph CAD database
- Demonstrate various parts of the Intergraph system to Customer SMEs to facilitate discussion of possible areas where data might be converted
- Facilitate discussions on whether the converted data should reside in the production database or in an offline archive database
- Examine documentation and sample data from the legacy system(s)

At the conclusion of the analysis, Intergraph will produce a Data Conversion Study document that contains:

- A high-level discussion of the feasibility of converting legacy data into CAD
- Identification of functional areas of the legacy system that are considered good candidates for conversion and those areas that are not considered good candidates, along with reasons why the functional areas are classified as “good” or “not good” candidates for conversion
- The historical time frame of the data to be converted
- An assessment of the adequacy and availability of required data based on its location
- An analysis of the advantages and disadvantages of putting the converted data in the production CAD system versus an offline database accessible to users
- Ways to access and display data kept in an offline database

Intergraph will start mapping the legacy data to the new data fields, and will continue to make modifications as necessary after completing this task. Intergraph will use a spreadsheet, which will be incorporated into the Data Conversion Study document, to develop a matrix mapping legacy data fields to corresponding fields in CAD database tables. On the mapping matrix, the legacy data file layout will be listed as source information, along with the field size, format, and a short description. The matching field name of the target CAD table, its data type and a comment field for noting missing or unmatched data, translation requirements or other general comments will be identified for each source data field.

During the development of the mapping matrix, Intergraph and the Customer will hold discussions to resolve issues and field mapping questions. Once Intergraph has completed a draft of the mapping matrix, it will provide a draft to the Customer for review. Intergraph and the Customer will hold a joint design review meeting via a conference call to review the proposed mapping matrix and jointly agree on necessary changes. Intergraph will incorporate the changes into the final mapping matrix for inclusion in the Data Conversion Study.

Once the Data Conversion Study is updated, the Intergraph and Customer Project Managers, along with the Data Conversion Team, will discuss a schedule for moving forward with data conversion.

Note that although Intergraph is not responsible for the quality of any legacy data supplied by the Customer, Intergraph will report any discovered data errors or omissions to the Customer for resolution.
Intergraph Team Participation:
- CAD Data Conversion Implementer
- Project Manager

Customer Team Participation:
- Subject Matter Experts including Legacy System Administrators
- Project Manager

Prerequisites:
- Completion of Project Planning Meeting
- Completion of Project Schedule Review

Deliverables:
- Intergraph on-site services and remote services
- The “working” CAD Data Conversion Study that will be kept up to date throughout the data conversion process
- A data mapping spreadsheet that ultimately will be incorporated into the CAD Data Conversion Study

Intergraph responsibilities:
- Spend one (1) week on-site gathering information necessary to analyze legacy data conversion options
- Produce the CAD Data Conversion Study
- Create the Mapping Matrix that maps legacy data fields to Intergraph data fields
- Hold a joint design review session
- Update Mapping Matrix as necessary during the course of the project
- Initiate discussion of the data conversion schedule for the remainder of the project

Customer responsibilities:
- Supply a subset of data to the CAD Data Conversion Implementer for use in the analysis and data mapping
- Ensure Subject Matter Experts who understand the structure and use of legacy data are available to work with the Intergraph CAD Data Conversion Implementer for the duration of this task
- Provide additional data or scrubbed data based on feedback from Intergraph CAD Data Conversion Implementer if requested

Completion Criteria:
This task is considered complete upon mutual agreement of the initial data mappings documented in the Mapping Matrix and upon Customer approval of the initial version of the CAD Data Conversion Study.
16. CAD DATA CONVERSION – SCRIPTING

The objective of this task is to create scripts based on the data mapping completed in the Data Conversion Analysis and Mapping Task, run the scripts, reconcile any discovered script discrepancies and provide feedback to the Customer so it can start making corrections to legacy data necessary to facilitate data conversion to the Intergraph system. These scripts may include coding to reformat dates and/or parsing name and address data, but will not include any type of legacy data cleanup, such as reformatting free-form text fields or eliminating duplicate names.

Intergraph Team Participation:

- CAD Data Conversion Implementer
- Project Manager

Customer Team Participation:

- Subject Matter Experts including Legacy System Administrators
- Project Manager

Prerequisites:

- Completion of Approval of the initial CAD Data Conversion Study

Deliverables:

- Data Conversion Scripts
- Updated CAD Data Conversion Study reflecting the Data Conversion Scripts

Intergraph responsibilities:

- Write data conversion scripts using the data mapping and Customer-provided legacy data
- Run the scripts using sample data provided by the Customer
- Identify any errors in the scripts and revise the scripts accordingly

Customer responsibilities:

- Provide sample legacy data to Intergraph
- Start correcting the legacy data necessary to facilitate data conversion to the Intergraph system

Completion Criteria:

This task is considered complete when the conversion scripts have been developed and are operational without any run-time errors, and when Intergraph has provided the Customer with the CAD Data Conversion Study updated to reflect the Data Conversion Scripts.
17. CAD DATA CONVERSION – AUDIT CONVERSION

The Audit Conversion will focus on uncovering any legacy data or conversion script issues. Prior to this task, the Customer will need to provide Intergraph with a sample of legacy data that is large enough to allow Intergraph and Customer to perform a quality audit on the imported data. During this task, Intergraph will convert the representative sample of legacy data into the Intergraph CAD application.

The Intergraph Conversion Implementer will then conduct an Audit Conversion Workshop, which is an on-site review of the data with the Customer. During the Workshop, Intergraph and the Customer will:

- Compare legacy data with converted data to ensure the completeness and accuracy of conversion
- Compare converted data with Data Conversion Mapping Matrix
- Document issues and errors

Intergraph will record any issues and errors found and update the Data Conversion Study accordingly. The Intergraph Conversion Implementer will correct any issues and errors found with the conversion scripts during the conversion audit review. After the Workshop, the Customer should continue to audit the converted data and address any legacy data issues it finds.

The Audit Conversion will be scheduled to allow sufficient time to conduct a thorough audit and then correct any script errors or legacy data issues prior to running the Final Conversion.

**Intergraph Team Participation:**
- CAD Data Conversion Implementer
- Project Manager

**Customer Team Participation:**
- Subject Matter Experts, including Legacy System Administrators
- Project Manager

**Prerequisites:**
- Development of CAD Data Conversion Scripts
- Approved Data Mapping document
- Delivered and approved data conversion scripts

**Deliverables:**
- Intergraph on-site services
- Initial data set converted
- Updated Data Conversion Study with audit results
Intergraph responsibilities:
- Conduct conversion of representative sample of legacy data into Intergraph application
- Conduct Audit Conversion Workshop
- Update the Data Conversion Study document and/or the data mapping spreadsheet with changes in response to issues discovered or desired changes by the Customer

Customer responsibilities:
- Provide Intergraph with representative sample of legacy data
- Attend Audit Conversion Workshop
- Provide the Intergraph CAD Data Conversion Implementer with feedback on the initial conversion of data
- Validate data conversion and document changes desired
- Continue to correct the legacy data necessary to facilitate its conversion to the Intergraph system

Completion Criteria:
This task is considered complete when the CAD Audit data conversion is completed and reviewed with the Customer, and any issues or desired changes agreed upon during this task have been updated in the Data Conversion Study and/or the Mapping Matrix.

18. I/CAD CONFIGURATION ESSENTIALS TRAINING (IPST9004)

Intergraph will provide the I/CAD System Configuration Essentials course, per the Training Curriculum included in Attachment E. The I/CAD System Configuration Essentials course is a 3-day course for Customer personnel responsible for CAD application administration. Students receive both classroom training and hands-on experience, enabling them to perform the basic functions associated with administrative support of the I/CAD System.

Topics to be covered include:
- Configuration maintenance and the registry
- I/CAD parameters
- Command line configuration
- Configuring monitors and map views
- Using macros
- Print template configuration
- I/NetViewer configuration
- Documentation/change log and other maintenance log generation

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Project Manager
Customer Team Participation:
- CAD Administrators
- Project Manager

Prerequisites:
- N/A

Deliverables:
- I/CAD Configuration Essentials course (PST9004)
- Materials for I/CAD Configuration Essentials course (IPST9004)

Intergraph responsibilities:
- Conduct the on-site I/CAD Configuration Essentials course

Customer responsibilities:
- Provide space for Intergraph to conduct training
- Ensure appropriate Customer personnel attend training

Completion Criteria:
The task is considered complete at the conclusion of the I/CAD System Configuration Essentials course.

**19. CAD SYSTEM CONFIGURATION**

The objective of this task is to complete the Customer-specific configuration of the I/CAD System to support Law Enforcement call taking, dispatching operations, administrative and supervisory operations. Intergraph will work both on-site and off-site to complete this task. On-site, Intergraph will conduct three (3) one-week system configuration sessions.

At the conclusion of the final On-Site System Configuration Session, Intergraph will provide the Customer with a Site Configuration Document. The Site Configuration Document is a working document that will be updated throughout implementation, and finalized and delivered at System Cutover.

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Project Manager

Customer Team Participation:
- CAD Core Team
- Project Manager
Prerequisites:
- Completion of I/CAD Configuration Essentials Training
- Completion of all preceding project tasks, with the exception of Data Conversion
- Customer confirmation that it has tested all interface connections and confirmed them as operational

Deliverables:
- Three (3) on-site System Configuration sessions
- CAD Site Configuration Document
- CAD system configured per Customer Public Safety Departments’ work requirements

Intergraph responsibilities:
- Conduct three (3) on-site System Configuration sessions
- Provide additional remote configuration effort as needed to complete this task
- Complete the setup and configuration of all I/CAD System interfaces per approved ICDs

Customer responsibilities:
- Ensure appropriate personnel attend and participate fully and collaboratively in all System Configuration sessions
- Provide department-specific I/CAD configuration and workflow data as needed
- Provide I/CAD interface configuration and workflow data as needed

Completion Criteria:
This task is considered complete upon the delivery of the draft Site Configuration document after the System Configuration session, and mutual agreement that the system is configured for the participating Customer Public Safety Departments’ specific operations, and is ready for the acceptance testing and user training that will begin in the next project phase.

20. MOBILE FOR PUBLIC SAFETY (MPS) CONFIGURATION WORKSHOP

During this task, Intergraph will configure the MPS for each Customer department, providing one client build for Law Enforcement. Intergraph will conduct a 1-week workshop with each Customer public safety department (Law Enforcement) to configure the MPS application. During the workshops, Intergraph will gather information on workflows as they pertain to the mobile environment and configure the MPS application accordingly. Workshop content will include:
- Overview of MPS features and functions
- MPS workflow definition
- Graphical user interface design and configuration
- Report format design and configuration
- MPS administrative functions
- Other configuration settings as needed

The Customer will need to make available at least one Dispatcher familiar with I/CAD and its use to perform dispatching and other I/CAD tasks as necessary during each workshop. Upon completion of this task, the Customer will have one (1) mobile configuration of the MPS product for testing and MPS end-user training. Intergraph will provide each public safety department with tailored MPS Configuration Documentation.

**Intergraph Team Participation:**
- Interface Lead
- Project Manager

**Customer Team Participation:**
- Mobile Subject Matter Experts
- Dispatch CAD Core Team representative
- Project Manager

**Prerequisites:**
- Completion of CAD Configuration Task

**Deliverables:**
- Intergraph on-site services
- MPS Site Configuration Documentation that includes configuration designs for the Sheriff’s Office
- One (1) Mobile for Public Safety client configuration build

**Intergraph responsibilities:**
- Conduct one (1) Mobile for Public Safety Configuration Workshop
- Configure one (1) Mobile Public Safety client build
- Provide a MPS Site Configuration Document with MPS configuration designs

**Customer responsibilities:**
- Provide mobile Subject Matter Expertise to Intergraph as needed
- Provide a Dispatching Subject Matter Expert to provide feedback on how the configuration will affect I/Dispatcher
- Participate fully and collaboratively in the configuration sessions with the understanding that Mobile Public Safety client configuration decisions must be documented and agreed upon at the conclusion of this session
- Review and approve the Mobile Public Safety Configuration Design Documents for each distinct configuration
- Review and approve the Mobile Public Safety client configurations
Completion Criteria:

The task is considered completed at the conclusion of the one (1) Mobile Public Safety workshop, after the one (1) Mobile Public Safety Configuration Design have been reviewed and approved by the Customer, and the Customer has verified that the one (1) Mobile Public Safety client configuration build delivered to the Customer conform to the MPS Configuration Design Document.

21. TECHNICAL HEALTH CHECK

This task allows the Intergraph CAD Technical Lead and the Intergraph Project Manager to coordinate with the Customer’s CAD Core Team to ensure that all Configuration Phase project tasks have been completed and the project is ready to transition to the Deployment Phase of implementation. Intergraph’s CAD Technical Lead and Project Manager will meet on-site with the Customer’s Project Manager and Core CAD Project Team to review project tasks completed to-date. If there are outstanding Configuration Phase items, the Intergraph and Customer Project Managers will mutually develop a plan to complete those items. The plan will include the potential impact of the outstanding items on the project schedule.

Intergraph Team Participation:

- CAD Lead
- Project Manager

Customer Team Participation:

- CAD Core Team
- Project Manager

Prerequisites:

- Successful completion of the Configuration Phase project tasks

Deliverables:

- Meeting notes
- Detailed status report of any outstanding items
- Plan to complete outstanding Configuration Phase tasks (if needed)

Intergraph responsibilities:

- Schedule meeting between Intergraph and the Customer
- Facilitate Technical Health Check meeting
- Provide meeting notes summarizing the status of project tasks
- Provide plan to complete outstanding Configuration Phase tasks (if needed)

Customer responsibilities:

- Ensure Core CAD Project Team attends Technical Health Check meeting
- Work with Intergraph Project Manager to develop plan to complete outstanding Configuration Phase tasks (if needed)
Completion Criteria:
This task is considered complete when all tasks within the Configuration Phase have been completed and/or a plan to complete outstanding project tasks has been approved by the Customer. All parties will mutually agree the project should continue to the next phase.

**DEPLOYMENT PHASE**

### 22. MAP DATABASE PROCESSING & MAP BUILD (#3) ON-SITE (IPST8004)

During this task, Intergraph will conduct I/MapEditor and GeoLabel Pro training or LabelEZ (if purchased), and guide the Customer through the installation of the final map build. The MapEditor training will cover how the source street centerline and address point data are used in the creation of the CAD database information. The GeoLabel Pro or LabelEZ training (if purchased) is specific to the data used in the CAD map and will cover text generation within CAD.

Prior to this task, the Customer should complete the correction of all source data issues noted as critical in the Data Analysis report. The final map build will incorporate updated and corrected data and feature symbology definitions supplied by the Customer. The Customer should arrange to bring in call takers and/or dispatchers for short sessions during the map build to provide a forum for allowing their input into the process. During the installation of this map build in the Customer's production CAD application, the Customer will take the lead and Intergraph will assist.

**Intergraph Team Participation:**
- Mapping Lead
- Project Manager

**Customer Team Participation:**
- GIS/Map Administrator
- Project Manager

**Prerequisites:**
- Completion of Map Build #2
- Customer correction of all source data issues noted as critical in the Data Analysis report

**Deliverables:**
- Training Services for Map Database Processing (IPST8004)
- Training Materials for Map Database Processing (IPST8004)
- Final map build

**Intergraph responsibilities:**
- Provide four (4) days on-site training of MapEditor and GeoLabel Pro
- Guide the Customer through the installation of the final map build on the Customer production system
Customer responsibilities:

- Correct all source data issues noted as critical in the Data Analysis report prior to submitting dataset for final map build
- Ensure availability of appropriate Customer personnel
- Ensure workstations to be used for the MapEditor and GeoLabel Pro training are functional in the production CAD environment prior to class
- Provide source data in a format compatible with the GeoMedia environment (e.g. shape-files)
- Provide information on the desired CAD map display and any changes the Customer has made to polygon (PLY) files, feature symbology and level structure (including modified .map files)
- Install and test the final map build on the production CAD environment
- Schedule short sessions to have call takers and/or dispatchers provide input regarding the final map build

Completion Criteria:

This task is considered complete at the conclusion of the on-site Map Database Processing (IPST8004) training and the installation of the final map in the CAD production environment.

23. CAD DATA CONVERSION – FULL CONVERSION

Intergraph will perform a full data conversion of the Customer’s legacy data in accordance with the Data Conversion Study. Intergraph will perform the conversion after the audit conversion is complete, all discrepancies have been resolved or a mutually planned remedy has been developed, and requested changes have been incorporated. The full conversion will include data extracted from an agreed starting date to a designated end date. This data will be converted and installed on the production servers used for testing prior to the Acceptance Testing. Intergraph will perform initial tests to ensure the accuracy of the converted data. The Customer will review the converted data to confirm that it has been converted in conformance with the Data Conversion Study.

The Customer will continue to use its existing legacy system until cutover of the I/CAD System. The collection of any new or modified data in the existing legacy system represents the “delta data” and Intergraph will convert the delta data into the operational CAD system during the Delta Conversion.

Intergraph Team Participation:

- CAD Data Conversion Implementer
- Project Manager

Customer Team Participation:

- Subject Matter Expert
- Project Manager
Prerequisites:
- Completion of audit conversion
- Conversion audit of initial data conversion
- Incorporation of Customer feedback into data conversion script
- Updated Data Conversion Study

Deliverables:
- Intergraph remote services
- Full Data Conversion, approximately a few weeks prior to cutover

Intergraph responsibilities:
- Perform full data conversion and place the data in the production system (Archive/Report Server) that will be used for Acceptance Testing
- Perform initial testing of converted data

Customer responsibilities:
- Ensure the appropriate Customer personnel are available to support the CAD Data Conversion Implementer during the data conversion
- Review converted data and verify that the data was converted in accordance with Data Conversion Study

Completion Criteria:
This task is considered complete when Intergraph has completed and tested the full CAD data conversion and the Customer has verified that the data was converted in accordance with the Data Conversion Study.

24. CAD/MOBILE FUNCTIONAL TEST DEVELOPMENT

Per the Acceptance Test Plan in Attachment G, Intergraph will provide our Standard Functional Acceptance Test Plan to formally verify system functionality. The Customer will review the Standard Acceptance Test Plan and can add additional site-specific scenarios and tests, as long as the scenarios and tests comply with the Customer’s original functional requirements. Intergraph will review all site-specific scenarios and tests added by the Customer. Intergraph and the Customer will mutually agree upon the final Functional Acceptance Test.

At the conclusion of the Functional Test development, the Customer will have the ability to use the Functional Tests to perform independent testing of CAD, Mobile, and CAD interfaces prior to the formal on-site Functional Testing Process with Intergraph. Intergraph recommends that the Customer perform the independent testing to validate the Functional Test scenarios and submit any potential changes to Intergraph before formal testing begins.
Intergraph Team Participation:
- CAD Lead/Business Analyst
- Interface Lead
- Mapping Lead
- Project Manager

Customer Team Participation:
- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager

Prerequisites:
- Completion of CAD System Configuration
- Completion of MPS Configuration Workshop

Deliverables:
- Intergraph remote services
- Functional Tests

Intergraph responsibilities:
- Provide the Functional Tests
- Review and approve Customer revisions to the Functional Tests

Customer responsibilities:
- Expand the Functional Tests to include Customer-specific scenarios and tests
- Review and approve the Final Functional Tests

Completion Criteria:
This task is considered complete upon the mutual approval of the Functional Tests by Intergraph and the Customer.
25. **CAD/MOBILE SUBSYSTEM INTEGRATION AND FUNCTIONAL TESTING**

Per the Acceptance Test Plan in Attachment G, the Customer, with on-site assistance from Intergraph, will conduct Functional Testing to confirm CAD/MPS Subsystem functionality using the mutually developed Functional Tests. The Customer will verify the operation of each functional item in the ATP using a scenario or test case. Intergraph and the Customer will jointly document and track the results of the test as either pass or fail. Intergraph will have up to ten (10) days to correct any functional item that fails a test, or provide a mutually acceptable written explanation of when the failed item will be corrected. The Customer has the right to conduct additional Functional Testing following any corrections.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager

**Prerequisites:**
- Successful completion of all prior tasks
- Completion of Data Conversion
- Customer and Intergraph mutual confirmation that the CAD/MPS Subsystem is ready for testing
- Development of the Functional Tests

**Deliverables:**
- Intergraph on-site services
- Completion of the CAD/Mobile Subsystem Integration and Functional Testing Task

**Intergraph responsibilities:**
- Certify the basic system capabilities as part of Intergraph standard software certification procedures
- Certify all applicable software, systems and ancillary systems, including the redundancy of production system, as ready for CAD/Mobile Acceptance testing
- Provide on-site assistance during Functional Testing
- Review any discrepancies found by the Customer during the Functional Testing
- Correct any functional item that fails a test, or provide a mutually acceptable written explanation of when Intergraph will correct the failed item
Customer responsibilities:

- Execute Functional Testing
- Track and document test results

Completion Criteria:

This task is considered complete when the Customer has provided acknowledgement that the CAD/Mobile System operates in accordance with the Functional Tests and Intergraph has either remedied items that failed the test or provided a mutually acceptable written explanation of when Intergraph will correct the failed items.

26. CAD STRESS AND PERFORMANCE TESTING

The objective of this task is to conduct a system throughput test to verify that the system will operate in conformance with response time requirements at peak loading levels as defined in the Performance Standards in Attachment G of the Agreement. The Customer and Intergraph will determine mutually acceptable parameters and the length of the stress test.

The Customer has the option either to create a “live” CAD test by manually creating events in CAD and performing other commands concurrently, or to use Intergraph’s automatic load generation utility to simulate dispatch operations in a live environment for basic call taking and dispatching commands.

If the Customer chooses to use Intergraph’s automatic load generator utility, Intergraph will perform the equivalent of a live test for loading of a minimum period of three (3) hours for CAD load testing. The utility will simulate event entry only with address validation, unit dispatch, unit en route, unit arrive, and unit clear commands; it cannot automatically simulate unit recommendations. Intergraph will configure the load test simulator with site-specific CAD data (such as valid Customer street address and commonplace names, Customer specific event types and police and fire units, etc). The utility will simulate system a transaction load corresponding to a rate of at least 100 dispatched incidents per hour.

Intergraph’s load test utility is only available for CAD; a comparable mobile product is not available. Further, interface load testing is not included in the load generation utility.

Intergraph will provide results of the test and, prior to System Cutover, issues will be resolved in accordance with the Acceptance Test Plan in Attachment G.

Intergraph Team Participation:

- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

Customer Team Participation:

- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager
Prerequisites:
- Completion of the Functional Testing
- Completion of all data conversion tasks

Deliverables:
- Intergraph remote services
- Test report of the load generation utility (if used)

Intergraph responsibilities:
- Provide an automatic load generation utility
- Configure the utility with Customer site specific data (if used)
- Provide results of the test and resolve any issues in accordance with the Acceptance Test Plan in Attachment G

Customer responsibilities:
- Review and approve the test report of the load generation utility (if used)

Completion Criteria:
This task is considered complete at the conclusion of the Stress Test, and when the Customer agrees that the CAD System operates and meets response time requirements at peak loading levels as defined in Attachment G of the Agreement.

27. CAD SYSTEM TUNE-UP

The purpose of the four (4) day on-site CAD System Tune-Up Session is to address any miscellaneous technical issues, and workflows that require additional attention. Prior to the session, the Customer should prepare to discuss technical, functional, and workflow issues it has discovered. Ideally, the Customer will send Intergraph a list of the issues one week before the session. During the CAD System Tune-Up Session, Intergraph will meet with the Customer’s Core CAD Project Team to discuss, document, and refine the configuration of the Customer’s I/CAD System. At the end of this task, the CAD configuration will be considered “frozen.”

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

Customer Team Participation:
- CAD Core Team
- Project Manager
Prerequisites:
- Completion of CAD System Configuration Sessions
- Completion of CAD Functional Testing
- Completion of CAD Stress and Performance Testing

Deliverables:
- Intergraph on-site services
- Frozen CAD configuration

Intergraph responsibilities:
- Conduct one (1) on-site CAD tune-up session
- Review, discuss and modify system configuration issues not previously addressed during other prior project phases, assuming that said issues are not beyond the scope of the contract with the Customer

Customer responsibilities:
- Ensure appropriate Customer personnel are available as needed
- Provide Intergraph a list of technical and/or workflow items it wishes to review with the Intergraph I/CAD Technical Team for review one (1) week prior to the schedule System Tune-Up session

Completion Criteria:
This task is considered complete at the conclusion of the scheduled on-site System Tune-Up session, and when Intergraph and the Customer mutually agree that the CAD configuration is frozen.

28. INTERGRAPH I/CAD SYSTEM MAINTENANCE AND ADMINISTRATION ESSENTIALS (IPST9003)

Per the Training Curriculum in Attachment E, Intergraph will provide the I/CAD System Maintenance and Administration Essentials training. During this task, Intergraph will provide an overview of administration and maintenance tasks required to manage, and/or support the I/CAD System. Participants receive both classroom training and hands-on experience enabling them to perform the basic functions associated with the daily operation and support of the I/CAD System.

The following topics will be covered during the training:
- I/CAD System overview
- Configuration maintenance and the registry
- Basic configuration of parameters and command line
- Database client and application components
- Listener overview
- Redundancy and recovery
- Clock synchronization
- Regular maintenance tasks
- Troubleshooting
- Logging/support process
- Customer care center procedures
- Documentation/change log and other maintenance log generation

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Project Manager

**Prerequisites:**
- Completion of I/CAD System Tune-up

**Deliverables:**
- Training services for I/CAD System Maintenance and Administration Essentials (IPST9003)
- Training materials for I/CAD System Maintenance and Administration Essentials (IPST9003)

**Intergraph responsibilities:**
- Conduct one (1) on-site session.

**Customer responsibilities:**
- Ensure appropriate Customer personnel attend and participate in training.

**Completion Criteria:**
This task is considered complete at the conclusion of the I/CAD System Maintenance and Administration Essentials (IPST9003) training.
29. BUILD REMAINING SYSTEMS – TEST/TRAINING AND BACKUP/DISASTER RECOVERY

Once the CAD/MPS System has been demonstrated to operate in accordance with the Functional Tests and the configuration is “frozen” (i.e., at the conclusion of the CAD Tune-up session), Intergraph will replicate the Production environment into the remaining environments (Test/Training and Backup/Disaster Recovery environments). The Customer will be responsible for configuring the virtualized hardware per the CAD-LRMS Configuration Diagram in Attachment C, and Intergraph will be responsible for building the software environments.

The Customer and Intergraph will work together to develop mutually acceptable test scenarios appropriate to each environment to ensure that the environment operates as intended. After Intergraph has built the Test/Training and Backup/Disaster Recovery Environments, the Customer will conduct the tests. The Customer and Intergraph will document and track Failures, and Intergraph will be responsible for correcting Failures. Cutover cannot occur until Intergraph has corrected Failures and the Subsystem as a whole passes the tests indicating that it will operate as intended in all Environments. The Customer reserves the right to conduct tests on a corrected Environment to ensure that the Failure was corrected and the Environment operates as intended.

Intergraph Team Participation:
- CAD Lead
- CAD Project Manager

Customer Team Participation:
- IT Resources
- Project Manager

Prerequisites:
- Customer configuration of the virtualized environment
- Completion of CAD/MPS Functional Testing
- Completion of CAD Stress and Performance Testing
- Completion of CAD System Tune-up

Deliverables:
- Intergraph on-site services
- CAD/MPS System installed and tested in the Test/Training Environment
- CAD/MPS System installed and tested in the Back-up/Disaster Recovery Environment

Intergraph Responsibilities:
- Install the CAD/MPS system in Test/Training environment and monitor testing to ensure the Environment operates as intended
- Install the CAD/MPS system in the Back-up/Disaster Recovery Environment and monitor testing to ensure the Environment operates as intended
- Correct any Failures before System Cutover
Customer Responsibilities:

- Provide IT support, as required
- Develop scenarios to test that each Environment operates as intended
- Conduct testing to ensure the Environment operates as intended
- Document Failures
- Configure virtualized hardware

Completion Criteria:

This task is considered complete when the CAD/MPS Subsystem has been installed in the Test/Training and Back-up/Disaster Recovery Environments, and Intergraph and the Customer both agree that each Environment operates as intended.

30. I/CAD SCHEMA AND REPORTS OVERVIEW (IPST2009)

During this task, Intergraph will introduce the features of the COTS reporting functionality native to the CAD system per the I/CAD Schema and Reports Overview Training in the Training Curriculum in Attachment E. Intergraph will present the I/CAD schema and the skills required to create Customer reports to personnel responsible for developing CAD statistics, including call center, event, and unit history information. Intergraph will also cover how to conduct queries and create reports using Microsoft Access and/or SQL Plus.

Upon completion of this task, the Customer will have the ability to create Customer-specific reports and will need to do so prior to the Reporting Consulting.

Intergraph Team Participation:

- CAD Lead/Business Analyst
- Project Manager

Customer Team Participation:

- CAD Core Team
- Project Manager

Prerequisites:

- Completion of I/CAD System Maintenance and Administration Essentials (IPST9003)

Deliverables:

- Intergraph on-site training services for I/CAD Schema and Reports Overview (IPST2009)
- Training materials for I/CAD Schema and Reports Overview (IPST2009)

Intergraph responsibilities:

- Conduct one (1) on-site session
Customer responsibilities:

- Ensure appropriate Customer personnel are available
- Participate fully and collaboratively in the training sessions
- Begin development of Customer-specific CAD reports

Completion Criteria:
The task is considered complete at the conclusion of the I/CAD Schema and Reports Overview training (IPST2009).

31. TRAIN-THE-TRAINER TRAINING

Intergraph will provide Trainer Consulting, as well as Train-the-Trainer sessions per the Training Curriculum in Attachment E. These courses will train Customer training personnel (call takers, dispatchers, supervisors, and administrators) on the use of the CAD system and prepare them to lead end-user training. It will also train Customer technical personnel on the operation and support of CAD system. Before the training sessions, Intergraph will provide training materials to the Customer, which is responsible for making enough copies for each participant in each class.

Intergraph Team Participation:

- Project Manager
- Trainers

Customer Team Participation:

- CAD Core Team
- Project Manager
- Trainers

Prerequisites:

- CAD System operates in accordance with the Acceptance Test Plan in the Production environment
- CAD System is installed and tested in the Training environment
- Delivery of training materials

Deliverables:

- Intergraph on-site training services

Intergraph Responsibilities:

- Provide CAD training for Customer Technical and Training staff members for all installed CAD software, as defined in the Pricing Detail and Deliverables Summary in Exhibit A of the Agreement and the Training Curriculum in Attachment E
- Provide one (1) complete set of printed training materials
Customer Responsibilities:

- Designate and assign personnel to receive training in groups not to exceed the class size listed in the Training Curriculum in Attachment E
- Provide sufficient copies of training documentation to support all students in the training classes
- Provide the necessary classrooms, facilities, and copies of the materials
- Provide one full-function workstation per student, one full-function workstation for the instructor, an LCD, a projection screen, a whiteboard and connectivity to the server
- Ensure that appropriate Customer Training personnel and System Administrators are available to actively participate in the entire scheduled training programs

Completion Criteria:

This task is considered complete at the conclusion of all Intergraph-provided Train-the-Trainer sessions as per the Pricing Detail and Deliverables Summary in Exhibit A of the Agreement and the Training Curriculum in Attachment E.

32. Map Maintenance for I/CAD Systems Training (IPST8003)

The objective of this task is to train Customer personnel on the complete process required to create the Customer's CAD Map build from its source data. Intergraph will provide four (4) days of on-site map training per the Training Curriculum in Attachment E. During the training, Intergraph and the participants will refine the Customer workflow documentation based on site-specific details for the workflow. The responsibility for maintaining this documentation will be turned over to the Customer at the end of the week. Because of the large amount of material that must be covered and the interactive nature of this workshop, class size is limited to four (4) participants and two (2) observers.

Following this training session, the Customer will be responsible for all future map builds and updates for the CAD system.

Intergraph Team Participation:

- Mapping Lead
- Project Manager

Customer Team Participation:

- GIS/Map Administrator
- Project Manager

Prerequisites:

- Map Build I, II and III
- Map Basic Training and Map Workshop
Deliverables:
- On-site training Services for Map Maintenance for I/CAD Systems (IPST 8003)
- Training Materials for Map Maintenance for I/CAD Systems (IPST 8003)

Intergraph responsibilities:
- Provide four (4) days of map training services.
- Provide custom workflow documentation

Customer responsibilities:
- Designate and assign four (4) Customer personnel to receive training
- Ensure that appropriate Customer mapping/GIS personnel are available to actively participate in the scheduled training program and attend scheduled training class in their entirety
- Ensure that any workstations to be used for the training are fully installed and functional prior to class

Completion Criteria:
The task is considered complete at the conclusion of the Map Maintenance for I/CAD Systems (IPST 8003 training.

33. PRODUCT DOCUMENTATION

Intergraph will deliver final technical documentation as listed under the “Deliverables” section below. Documentation will be delivered in electronic copy, which will enable the Customer to distribute copies within the Customer organization as needed to support the CAD/MPS applications. As required, the product documentation will be tailored to include any customizations purchased by the Customer.

Intergraph Team Participation:
- CAD/Mobile Documentation Manager
- CAD Project Manager

Customer Team Participation:
- CAD Core Team
- Project Manager

Prerequisites:
- Completion of Functional Testing
- CAD configuration frozen at the completion of CAD System Tune-up
Deliverables:

- Intergraph will deliver the following final documentation:
  - System Administrative Guides
  - System Administration procedures
  - I/CAD Database configuration
  - I/CAD Server configuration
  - I/CAD system configuration and parameter settings
  - Documentation of site-specific applications, code, and macros (if applicable)
  - Mobile for Public Safety client configuration documents (one for each distinct agency configuration)
  - I/CAD Interfaces Configuration Document

Intergraph Responsibilities:

- Deliver the product documentation listed above

Customer Responsibilities:

- N/A

Completion Criteria:

This task is considered complete upon delivery of the documents listed above under the “Deliverables” section to the Customer.

34. CUTOVER PLAN

Intergraph and the Customer will jointly develop a Cutover Plan. The Cutover Plan will detail the steps necessary to move into live operations. To ensure that the move to live operations goes as smoothly as possible, the Cutover Plan will assign tasks and responsibilities to both Intergraph and Customer personnel during the final month before cutover to live operations. The Plan covers topics including Customer staffing, movement of equipment into final locations, final database clean out of test events, procedures to report issues and planned sequence of events for the cutover day.

Intergraph will provide the initial draft of the Cutover Plan to the Customer for review. The Customer will review the draft and provide feedback to Intergraph, which will incorporate the feedback into a final Cutover Plan.

Intergraph Team Participation:

- CAD Lead/Business Analyst
- Interface Lead
- Mapping Lead
- Training Lead
- Project Manager
Customer Team Participation:
- CAD Core Team
- Mobile Subject Matter Experts
- GIS/Map Administrator
- Project Manager

Prerequisites:
- N/A

Deliverables:
- Intergraph on-site services and remote services
- Cutover Plan

Intergraph responsibilities:
- Create a draft CAD Cutover Plan
- Work with Customer personnel to refine the Cutover Plan
- Review and approve the final Cutover Plan

Customer responsibilities:
- Review and comment on the draft CAD Cutover Plan
- Work with Intergraph personnel to refine the Cutover Plan
- Review and approve the final Cutover Plan

Completion Criteria:
This task is considered complete when the Customer has reviewed and approved the final Cutover Plan.

35. Readiness Review

The purpose of this on-site meeting between Intergraph and the Customer is to confirm that all preparations for go-live activities have been completed. The Readiness Review verifies that the following has occurred:
- Cutover Plan approval
- Pre-Cutover Testing according to the Acceptance Test Plan
- Establishment and approval of a schedule for cutover activities
- Identification and scheduling of Intergraph and Customer resources required for go-live activities
- Notification of planned system cutover to internal and external interface stakeholders supplying systems integral to go-live operations
**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

**Customer Team Participation:**
- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager

**Prerequisites:**
- Completion of all Pre-Cutover Testing
- Completion of all end-user training designated by the Customer as being required for “go-live”
- System configuration has been frozen and final data conversion activities are planned
- Mutual agreement that the Test/Training and Backup/Disaster Recovery environments operate as intended
- Final Cutover Plan developed and approved

**Deliverables:**
- Intergraph on-site services

**Intergraph responsibilities:**
- Provide above noted resources to attend Readiness Review meeting

**Customer responsibilities:**
- Provide above noted resources to attend Readiness Review meeting
- Provide final “go-live” approval

**Completion Criteria:**
This task is considered complete upon conclusion of the Readiness Review meeting and documentation of Customer approval to commence with system go-live operations.
### 36. CAD/MPS CUTOVER

Once testing is complete, and Intergraph and the Customer have held the Readiness Review meeting, Intergraph will certify the CAD/MPS Subsystem as operational and ready for production operation. The final decision for Cutover to live operations ultimately rests with the Customer; however, both Intergraph and the Customer will review system status and jointly make a recommendation to move into production. Intergraph intends to cutover both the CAD and MPS components of the CAD/MPS Subsystem at the same time; should the Customer decide to cutover CAD a significant period of time before the MPS Cutover, the Customer and Intergraph would need to initiate a Change Order and adjust the Project Schedule and Payment Milestones accordingly.

Upon Cutover, Intergraph personnel will assist the Customer in placing the system into productive use. Intergraph personnel will be on-site at least one (1) day prior to live operations and will provide post-live on-site support for four (4) days, with on-going focused phone support following the on-site support period.

Customer technical personnel must be present to provide support for the system. Customer training personnel and core team members will be scheduled to provide knowledgeable Customer support to all shifts during the first few days after cutover to live operations in conjunction with the scheduled Intergraph staff.

As of cutover of both the CAD and MPS to live operations, the Subsystem enters the extended warranty period, and the 30-day reliability test period will begin.

**Intergraph Team Participation:**
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager
- Trainers

**Customer Team Participation:**
- CAD Core Team
- Mobile Subject Matter Experts
- Project Manager
- IT Resources
- Trainers

**Prerequisites:**
- Completion of all prior projects tasks
- Completion and acceptance of the Cutover Plan
- Completion of the Readiness Review meeting

**Deliverables:**
- Intergraph on-site support services for one (1) week during cutover
Intergraph responsibilities:

- Assist the Customer staff in placing CAD and MPS into a production status
- Monitor the initial operation of CAD and answer any operational questions raised by the Customer.
- Assist the training staff in utilizing the system
- Assist the technical staff in supporting the system
- Provide remote support following on-site cutover support

Customer responsibilities:

- Place the software into production and begin operational use in consultation with Intergraph and in accordance with the Project Schedule
- Provide technical staff to support the system
- Provide training staff to answer end-user questions, in conjunction with the Intergraph staff
- Provide a detailed list of questions and issues that still require explanation or resolution by Intergraph at the end of each day

Completion Criteria:

This task is considered complete when the CAD/MPS Subsystem has been cutover into live production.

### 37. CAD DATA CONVERSION – DELTA DATA CONVERSION

Intergraph will perform a delta data conversion to incorporate into the operational CAD system any legacy data that was added or modified in the legacy CAD application between the completion of full data conversion and cutover to live operations. Note that this task requires careful planning since the data will be inserted into the operational I/CAD System.

**Intergraph Team Participation:**

- CAD Data Conversion Implementer
- Project Manager

**Customer Team Participation:**

- Subject Matter Expert
- Project Manager

**Prerequisites:**

- Full Data Conversion
- CAD/MPS Cutover
Deliverables:
- Intergraph remote services
- Delta CAD Data Conversion

Intergraph responsibilities:
- Perform the delta data conversion after cutover
- Support data conversion post delta data conversion
- Fix conversion issues based on feedback from Customer

Customer responsibilities:
- Provide feedback to Intergraph if any issues with converted data are found

Completion Criteria:
This task is considered complete when the CAD delta data conversion has been completed and post data conversion issues have been resolved.

38. CAD/MPS 30-DAY PERFORMANCE AND RELIABILITY TEST

Per the Acceptance Test Plan in Attachment G, the Intergraph CAD/MPS Subsystem will undergo a 30-day Performance and Reliability test during which the System will maintain the performance, reliability and availability standards identified in Attachment G of the Agreement. See the Acceptance Test Plan for a description of the Performance and Reliability Criteria testing, definitions of error types, and the plan to remedy found errors.

The Customer is responsible for maintaining a log of any discovered problems. The log should containing detailed information as to the sequence of events leading up to the problem, time of day, node name or unit involved, and other such pertinent details. Intergraph is responsible for remedying found errors per the Acceptance Test Plan.

At the conclusion of the Performance and Reliability test, Intergraph will provide the Customer a final summary report documenting all issues that occurred during the 30-Day Performance and Reliability period, as well as the resolution activities for the issues.

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Interface Lead
- Project Manager

Customer Team Participation:
- CAD Core Team
- Mobile SME
- Mapping/GIS Lead
- Project Manager
Prerequisites:
- Cutover to live operations of the CAD/MPS system

Deliverables:
- Intergraph remote services
- Final summary report documenting all issues that occurred during the thirty (30) Day Performance and Reliability period, as well as the resolution activities for the issues

Intergraph responsibilities:
- Address and/or correct found errors per the appropriate resolution identified in Attachment G of the Agreement

Customer responsibilities:
- Use and monitor the CAD system in a production environment
- Maintain log of problems found
- Contact Intergraph personnel in a timely manner in the event of system problems or failures
- Begin system monitoring in support of the Extended Warranty period

Completion Criteria:
This task is considered complete after the CAD/MPS Subsystem successfully passes the 30-day Performance and Reliability Test per the Acceptance Test Plan in Attachment G.

39. I/Incident Analyst Configuration and Administration (IPST6001)

During this task, Intergraph will train the Customer on the installation, maintenance, support, and customization of the I/Incident Analyst product, an incident mapping and management analysis application. The Customer will also be trained on the maintenance of the various data sources used by the system. Per the Training Curriculum in Attachment E, I/Incident Analyst Training will cover the following topics:

- Installation and Setup of Incident Analyst
- Establishing data source connections
- Customization/Extensibility to meet customer’s reporting/mapping needs
- Creating Map, Chart, Spreadsheet and Report Output
- Setting up a client workstation

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Project Manager
Customer Team Participation:
- CAD Core Team
- Project Manager

Prerequisites:
- Completion of I/CAD Schema and Reports Overview (IPST2009)
- Completion of CAD Cutover

Deliverables:
- On-site training services for I/Incident Analyst Configuration and Administration (IPST6001)
- Training materials for I/Incident Analyst Configuration and Administration (IPST6001)

Intergraph responsibilities:
- Conduct one (1) on-site session

Customer responsibilities:
- Ensure appropriate Customer personnel are available
- Perform user training

Completion Criteria:
The task is considered complete after the delivery of the training materials for I/Incident Analyst Configuration and Administration (IPST6001) and at the completion of the training session.

40. Reporting Consulting

Intergraph will provide two on-site sessions, four (4) days each, of collaborative on-site consulting to enhance the Customer’s report development capabilities. Intergraph introduced the available CAD reporting functionality during the I/CAD Schema and Reports Overview, after which the Customer began the creation of Customer-specific reports. The objective of this task is further enable the Customer to create its own reports using available tools. As such, Customer participants must have been sufficiently involved in the CAD Staging and Configuration phases to understand what data is available to be used in reports. After this consulting session, it is the responsibility of the Customer to create any custom reports essential to operations.

Intergraph Team Participation:
- CAD Lead/Business Analyst
- Project Manager

Customer Team Participation:
- CAD Core Team
- Project Manager
Prerequisites:

- Completion of the Intergraph I/CAD Database Schema and Reports Overview Session (IPST2009)
- Completion of I/Incident Analyst Configuration and Administration (IPST6001)
- Completion of I/Incident Analyst End-User Training (IPST6002)

Deliverables:

- On-site consulting services for reporting
- Recommendation Report

Intergraph responsibilities:

- Provide two on-site sessions, four (4) days each of consulting services
- Assist the Customer in developing customized reports
- Provide a Report Recommendation Report, which includes the types of reports the Customer may want to consider for future development

Customer responsibilities:

- Ensure availability of appropriate Customer personnel
- Provide training room with projector, white board and remote access to Customer network
- Provide database access to the servers where the Customer-developed functional reports reside
- Provide samples of all reports deemed essential to operations for internal requests
- Provide reports created after completion of the I/CAD Database Schema and Reports Overview Session
- Prioritize the reports deemed essential to operations

Completion Criteria:

This task is considered complete at the conclusion of the workshop and the delivery of the Report Recommendation Report.

41. MPS REASSESSMENT (IPST2007)

After the MPS has been operational for at least 30 days, Intergraph will provide one (1), four (4) day MPS Reassessment session. The objective of these sessions is to review the original design of the MPS client build in conjunction with the current department operations. During the sessions, Intergraph will review and discuss:

- Existing utilities
- New utilities
- GUI or other configuration changes
- Customized training or retraining of specific areas

Prior to the Reassessment Sessions, the Customer should be prepared with a list of issues, questions and concerns. Ideally, the Customer will provide the list to Intergraph a week before the Sessions begin.
Based on a review of operations and feedback from the Customer, Intergraph will make recommendations as to any
configuration changes that would enhance the operation of the MPS system. Depending on the scope and
complexity of the recommendations, Intergraph may be able to complete the modifications during the on-site week.
If the Customer desires modifications that cannot be completed during the on-site reassessment session, Intergraph
will document the desired modifications and provide the Customer with a quote for services to complete the
modifications.

After the Reassessment Sessions, Intergraph will provide the Customer with a MPS Reassessment Report
documenting actions taken and a plan for resolving additional items identified during the Sessions.

**Intergraph Team Participation:**
- Interface Lead
- Trainers

**Customer Team Participation:**
- Mobile Subject Matter Experts
- Project Manager

**Prerequisites:**
- MPS System cutover into production
- Completion of CAD/MPS 30-Day Performance and Reliability Test (or earlier at the discretion of the Customer)

**Deliverables:**
- Intergraph on-site consulting services for one (1) MPS Reassessment Session (IPST2007)
- MPS Reassessment Report of actions taken and a plan for resolution of additional items identified during
the Reassessment Sessions

**Intergraph responsibilities:**
- Provide MPS Reassessment Session
- Assess MPS operations in the Customer's environment
- Provide recommendations for workflow streamlining and data enhancement
- Provide MPS Reassessment Report

**Customer responsibilities:**
- Ensure appropriate Customer personnel attend training
- Develop a list of items and process issues to be reviewed and deliver this to Intergraph at least one (1)
week prior to the MPS Reassessment session

**Completion Criteria:**
This task is considered complete at the conclusion of the MPS Reassessment session and the delivery of the
MPS Reassessment Report.
42. CAD REASSESSMENT (IPST2006)

After CAD has been in operational status for at least 30 days, Intergraph will provide one (1) four (4) day CAD Reassessment session. The objective of these sessions is to review the original design of CAD configuration in conjunction with the current department operations. During the sessions, Intergraph will review and discuss:

- Review of existing utilities
- Instruction on new utilities
- Use of existing functionality to optimize center operations
- GUI, command line, or other configuration changes
- Customized training or retraining of specific areas
- Department operations

Prior to the Reassessment Session, the Customer should be prepared with a list of issues, questions, and concerns. Ideally, the Customer will provide the list to Intergraph a week before the sessions begin.

Based on a review of operations and feedback from the Customer, Intergraph will make recommendations as to any configuration changes that would enhance the operation of the CAD system. Depending on the scope and complexity of the recommendations, Intergraph may be able to complete the modifications during the on-site week. If the Customer desires modifications that Intergraph cannot complete during the on-site reassessment session, Intergraph will document the desired modifications and provide the Customer with a quote for services to complete the modifications.

After the Reassessment Sessions, Intergraph will provide the Customer with a CAD Reassessment Report documenting actions taken and a plan for resolution of additional items identified during the Sessions.

Intergraph Team Participation:
- Interface Lead
- Trainers

Customer Team Participation:
- CAD Core Team
- Project Manager

Prerequisites:
- CAD System cutover into production
- Completion of CAD/MPS 30-Day Performance and Reliability Test (or earlier at the discretion of the Customer)

Deliverables:
- Intergraph on-site consulting services for one (1) CAD Reassessment Session (IPST 2006)
- CAD Reassessment Report of actions taken and a plan for resolution of additional items identified during the Reassessment Session
Intergraph responsibilities:

- Conduct one (1) CAD Reassessment Session
- Assess CAD operations in the Customer’s environment.
- Provide recommendations for workflow streamlining and data enhancement
- Provide CAD Reassessment Report

Customer responsibilities:

- Ensure appropriate Customer personnel attend training.
- Develop list of items and process issues to be reviewed and deliver this to Intergraph at least one week prior to the CAD Reassessment session.

Completion Criteria:

This task is considered complete at the conclusion of the one (1) CAD Reassessment session and the delivery of the CAD Reassessment Report.

**43. MAP WORKFLOW REASSESSMENT**

The Map Reassessment is designed to allow the Intergraph consultant to work with the Customer Mapping Lead in a collaborative session to further refine and streamline the customer map production process. During this week the Intergraph consultant will review specific training and workflow topics as requested by the customer, and make recommendations on process changes and map design items as appropriate.

**Intergraph Team Participation:**

- Mapping Lead

**Customer Team Participation:**

- GIS/Map Administrator

**Prerequisites:**

- CAD System cutover into production
- Completion of CAD/MPS 30-Day Performance and Reliability Test (or earlier at the discretion of the Customer)

**Deliverables:**

- Intergraph on-site consulting services for one (1) Map Workflow Reassessment Session
Intergraph responsibilities:

- Conduct one (1) Map Workflow Reassessment Session
- Review training topics as requested by customer
- Provide recommendations for workflow streamlining and data enhancement (e.g. adding routing attribution)
- Provide advanced training information on map environment system setup, administration and configuration

Customer responsibilities:

- Designate and assign no more than four (4) Customer mapping/GIS personnel to attend the entire Reassessment Workshop. Two (2) additional people may attend training as observers/auditors
- Customer mapping staff have been actively working on the map process and have attempted to build at least one map dataset since the Map Maintenance training
- Deploy Map from the Map Staging database to the main CAD database
- Develop list of items and process issues to be reviewed and deliver this to Intergraph at least one week prior to the start of the consulting trip

Completion Criteria:

This task is considered complete at the conclusion of the one (1) Map Workflow Reassessment session.

44. Business Intelligence for CAD Implementation

The Business Intelligence (BI) Solution to be provided to the Customer is composed of the following primary software components:

- Intergraph Reporting and Analysis Data Foundation for CAD — the core platform that is used to create the unique Intergraph reporting data warehouse for public safety information
- Business Objects Web Intelligence™ — a query and analysis product that provides users with self-service information access and interactivity
- Business Objects Crystal Reports™ — a report design solution that allows users to create and design presentation quality reports
- Business Objects Xcelsius Enterprise™ — a product that allows users to create next-generation data visualization tools such as dashboards for the distribution and reporting of business-critical information
- Intergraph Web Report Viewer — a solution that contains the tools and report formats that allow agencies to utilize Web-based reports and dashboards built by Intergraph to view I/CAD data
This task consists of the following items:

- Installation of the Intergraph Business Intelligence Solution for I/CAD and Business Objects Applications
- Installation of database software and database creation
- Population of the data warehouse with processed I/CAD data
- The Business Intelligence Solution is based on a standard I/CAD database schema. The addition of custom fields to the Business Intelligence Solution can be accommodated at an additional cost
- The Business Intelligence Solution includes standard Business Intelligence reports created for I/CAD data. The addition of custom reports to the BI Solution can be accommodated at an additional cost
- Intergraph is not responsible for the quality of any supplied data. Intergraph will report any discovered data errors or omissions to the Customer for resolution

**Intergraph Team Participation:**

- CAD Lead/Business Analyst
- Project Manager

**Customer Team Participation:**

- CAD Core Team
- Database Administrator
- System Administrator as needed
- Network Administrator as needed
- Project Manager

**Prerequisites:**

- Successful cutover of CAD

**Deliverables:**

- Installation of the Business Intelligence for CAD Solution

**Intergraph responsibilities:**

- Prepare scripts for I/CAD data population based on extracted data provided by Customer before the on-site installation
- Provide the software as defined in the Pricing Detail and Deliverables Summary in Exhibit A
- Installation of the BI for CAD Solution
- Configure the environment for the extraction of production I/CAD data to a data warehouse to support the BI Solution. This includes all related data services including the creation of database, configuration and running of ETL scripts, populating the data warehouse, and set up CAD Universe
- Installation and configuration of standard reports to allow the viewing, querying, and reporting of the CAD data
Customer responsibilities:

- Provide an extraction of the I/CAD database not less than two weeks prior to on-site system installation
- The Customer shall provide Intergraph with access to all relevant data, documents, plans, reports, and analyses related to the scope of work and responsibilities of this project
- Observe system installation and support as necessary
- Participate in informal knowledge transfer, as well as documentation and system review
- Confirm that the software installation and delivery has been completed by Intergraph

Completion Criteria:

This task is considered complete when the Business Intelligence for CAD Solution has been installed including the population of the I/CAD data warehouse.

45. **BUSINESS INTELLIGENCE FOR CAD WORKSHOP AND TRAINING**

Intergraph will provide two (2) Business Intelligence for CAD Workshops to facilitate the configuration of the Business Intelligence Solution for CAD and two (2) Business Intelligence for CAD training sessions to transfer Business Intelligence knowledge to key County personnel as per the Training Curriculum in Attachment E. Before the training sessions, Intergraph will provide training materials to the Customer, which is responsible for making enough copies for each participant in each class.

**Intergraph Team Participation:**
- Project Manager
- Trainers

**Customer Team Participation:**
- CAD Core Team
- Project Manager

**Prerequisites:**
- Implementation of Business Intelligence for CAD Solution
- Delivery of training materials

**Deliverables:**
- Intergraph on-site training services

**Intergraph Responsibilities:**
- Provide Business Intelligence for CAD Workshops and Training, as defined in the Pricing Detail and Deliverables Summary in Exhibit A and the Training Curriculum in Attachment E
- Provide one (1) complete set of printed training materials
Customer Responsibilities:

- Designate and assign personnel to receive training in groups not to exceed the class size listed in the Training Curriculum in Attachment E
- Provide sufficient copies of training documentation to support all students in the training classes
- Provide the necessary classrooms, facilities, and copies of the materials
- Provide one full-function workstation per student, one full-function workstation for the instructor, an LCD, a projection screen, a whiteboard and connectivity to the server
- Ensure that appropriate Customer personnel are available to actively participate in the entire scheduled training programs

Completion Criteria:

This task is considered complete at the conclusion of the two (2) Business Intelligence for CAD Workshops and two (2) Business Intelligence for CAD Training sessions as per the Pricing Detail and Deliverables Summary in Exhibit A and the Training Curriculum in Attachment E.

46. CAD/MOBILE PROJECT CLOSURE

During this task, Intergraph and Customer project managers will review project activities and deliverables, and mutually agree that all CAD- and Mobile-related items purchased under the Contract have been delivered and are operational, all CAD- and Mobile-specific tasks are complete, major issues identified in use of the system in production have been corrected and all Payment Milestones to-date have been met.

Intergraph Team Participation:

- Project Manager

Customer Team Participation:

- Project Manager

Prerequisites:

- Completion of Statement of Work CAD Implementation Tasks

Deliverables:

- Intergraph remote services

Intergraph responsibilities:

- Verify with the Customer Project Manager that all CAD and Mobile-related items purchased under the Contract have been delivered and are operational, all CAD and Mobile specific tasks are complete, Intergraph has resolved all P1 and P2 issues, and all Payment Milestones to-date have been met
Customer responsibilities:

- Verify that all CAD and Mobile-related items purchased under the Contract have been delivered and are operational, all CAD and Mobile specific tasks are complete, Intergraph has resolved all P1 and P2 issues and all Payment Milestones to-date have been met.
- Ensure the payment of all invoices for Payment Milestones that have been met to-date

Completion Criteria:

This task is considered complete upon verification by the Intergraph and Customer project managers that all CAD/MPS-related items purchased under the Agreement have been delivered and are operational, Statement of Work CAD Implementation are complete, Intergraph has resolved all P1 and P2 errors, and all Payment Milestones to-date have been met.
LRMS/FBR IMPLEMENTATION TASKS

The following Law Enforcement RMS Subcontractor product(s)/services will be provided in accordance with this Statement of Work. Note that the term “LRMS” includes RMS, FBR, and Crime Analysis in the following sections.

47. LRMS BUSINESS PROCESS ANALYSIS

Intergraph will conduct Business Process Analysis (BPA) sessions early in the project lifecycle. The purpose of the BPA sessions is to enable Intergraph to gain an understanding of the current business processes in place within the Customer. Additionally, these sessions are designed to help Intergraph and the Customer begin to determine the most effective and efficient use of the proposed solution before it is implemented. Intergraph will conduct two (2) on-site BPA session, lasting three (3) days each.

Following the conclusion of the BPA session, Intergraph will develop a Business Process Analysis document. This document will provide a summary of the Customer's business processes, as discussed during the BPA meetings, and will be a combination of narrative and workflow diagrams. The document will also list any decisions and issues identified during the sessions. Intergraph will provide the BPA document to the Customer for review and incorporate any Customer feedback and comments into the final version.

**Intergraph Team Participation:**
- LRMS Business Analyst
- Project Manager

**Customer Team Participation:**
- LRMS Core Team
- SMEs included in portions of the meeting, as required
- Project Manager

**Prerequisites:**
- Project Planning Meeting
- Project Kick-off Meeting

**Deliverables:**
- Intergraph on-site services
- Draft Business Process Analysis Document
- Final Business Process Analysis Document
Intergraph Responsibilities:
- Develop Business Process Analysis materials, including an agenda
- Conduct Business Process Analysis session
- Document Business Process Analysis session findings
- Develop draft Business Process Analysis Document
- Develop final Business Process Analysis Document

Customer Responsibilities:
- Coordinate BPA session with Intergraph
- Identify BPA attendees and ensure they attend the session
- Provide meeting room for BPA session
- Review and approve the Business Process Analysis Document for completeness and accuracy

Completion Criteria:
This task is considered complete when Intergraph has delivered the final Business Process Document incorporating Customer feedback and comments.

48. LRMS COTS PRODUCT INSTALLATION IN PRODUCTION ENVIRONMENT

Intergraph will install the COTS LRMS, FBR, and Crime Analysis applications in the Production environment as soon as the Customer procures, installs, and configures the hardware, providing the Customer with access to the applications as early as possible in the project lifecycle so it can begin configuration tasks.

Product installation and configuration will include both on-site and remote services. After the on-site installation of the base software, Intergraph will access the subsystem remotely for subsequent implementation tasks, including configuring components, setting up interfaces, conducting installation testing, and troubleshooting problems.

Intergraph Team Participation:
- LRMS Lead
- LRMS Software Engineers
- LRMS QA Specialists
- Project Manager

Customer Team Participation:
- IT Resources
- Project Manager
Prerequisites:
- VPN access is available
- Completion of LRMS/FBR System Hardware Delivery and Installation

Deliverables:
- COTS LRMS, FBR, and Crime Analysis software installed in the Production environment

Intergraph Responsibilities:
- Install Oracle Relational Database Management Software
- Install COTS LRMS server software
- Install COTS LRMS client software on five (5) test workstations
- Install COTS FBR server software
- Install COTS FBR client software on five (5) test workstations
- Install COTS Crime Analysis server software
- Install COTS Crime Analysis client software on three (3) test workstations
- Conduct installation “Check Out” testing

Customer Responsibilities:
- Provide IT support, as required

Completion Criteria:
This task is considered complete once the COTS LRMS, FBR, and Crime Analysis software has been installed in the Production environment.

49. LRMS PRODUCT CUSTOMIZATION DETAILED REQUIREMENTS ANALYSIS (IF PURCHASED)

The purpose of the Detailed Requirements Analysis task is to finalize the requirements for any product customizations that the Customer is procuring.

The COTS LRMS, FBR, and CAGIS applications meet the majority of the Customer's RFP requirements.

Note: Currently there are no inPURSUIT customizations identified and priced; therefore, this task is applicable only if customizations result from the BPA or other project implementation activities. If customizations are identified, Intergraph will provide a quotation and change order. As an alternative approach, the County may implement FBR customizations themselves by purchasing the FBR API and associated training and consulting services.

If required and purchased, Intergraph will conduct two (2) on-site requirements analysis sessions, each lasting four (4) days. During the requirements analysis sessions, Intergraph will review and confirm its understanding of any customizations it will need to make to the COTS applications to comply with the results of the BPA.
Intergraph Team Participation:
- LRMS Business Analyst
- LRMS Technical Lead
- LRMS Interface Lead
- Project Manager

Customer Team Participation:
- LRMS Core Team
- SMEs Included in portions of the meeting, as required
- Third Party Interface Stakeholders
- Project Manager

Prerequisites:
- Completion of LRMS Business Process Analysis

Deliverables:
- Intergraph on-site services – two (2) on-site sessions of four (4) days each
- Detailed Requirements Analysis Report

Intergraph Responsibilities:
- Conduct on-site Requirements Analysis sessions
- Develop the Detailed Requirements Analysis Report

Customer Responsibilities:
- Coordinate Requirements Analysis Sessions with Intergraph, as required
- Identify the appropriate Subject Matter Experts for the Requirements Analysis sessions (note: appropriate Subject Matter Experts have the authority to make requirements decisions)
- Ensure Subject Matter Experts are available to participate in their designated sessions
- Provide meeting rooms for the Requirements Analysis sessions
- Review the Detailed Requirements Analysis Report and provide comments, as required

Completion Criteria:
This task is considered complete when Intergraph has delivered the final Detailed Requirements Analysis Report incorporating Customer feedback and comments.
**50. LRMS DATA CONVERSION – ANALYSIS**

Intergraph will be converting Customer legacy databases per the Pricing Detail and Deliverables summary in Exhibit A of the Agreement. Intergraph's data conversion price is based on the following assumptions:

- The Customer is responsible for exporting data from each legacy system and providing the data in an ODBC-compliant database format
- Intergraph will migrate data elements for which there is an existing target field in the RMS database. Intergraph's price does not include the addition of new fields to the database or to the system's GUI
- Intergraph’s price does not include "data cleansing" services

Intergraph will follow a structured approach to data conversion, which includes the following:

- Data Conversions Analysis including creation of Data Conversion Plan and Legacy Data Catalog
- Data Mapping*
- Data Conversion Scripting*
- Conversion Audits*
- Final Conversion*

(* Note: These services are described in detail in specific Tasks below. )

The LRMS Data Conversion Analysis Task consists of the following activities:

**Data Conversion Plan**

Intergraph will work with the Customer in the early stages of the project to jointly review all data conversion requirements, risks, and risk mitigation strategies. This effort will lead to a comprehensive Data Conversion Plan that outlines the related methodologies, schedule, and resources. As Intergraph collects additional information during the data conversion process, it will update the Plan accordingly.

**Legacy Data Catalog**

Intergraph will facilitate a two (2) day on-site Data Analysis Meeting with the Customer. The Customer should be prepared to provide Intergraph with any legacy data standards, such as address validation rules, master index matching rules and mandatory fields that Intergraph will need to include in the data conversion scripts. During the Data Analysis Meeting, Intergraph will outline the data conversion process and work with the Customer to develop a Legacy Data Catalog that documents the following for each legacy system:

- Subject Matter Experts for each legacy system
- Legacy data models (i.e., the Customer should provide Entity Relationship Diagrams and Data Dictionaries for each legacy system to be converted)
- Legacy data standards

After the on-site meeting, Intergraph will update the Data Conversion Plan to include the Legacy Data Catalog as an attachment and to indicate the order in which the legacy systems should be converted, since many of the systems contain duplicate data (such as names).
Intergraph Team Participation:
- LRMS Data Conversion Lead
- LRMS Data Conversion Engineers
- Project Manager

Customer Team Participation:
- Legacy System(s) SMEs
- Legacy System Administrator(s)
- Project Manager

Prerequisites:
- Completion of Business Process Analysis

Deliverables:
- Intergraph on-site and remote services – one on-site data conversion planning session lasting two (2) days
- Data Conversion Plan, including Legacy Data Catalog

Intergraph Responsibilities:
- Work with the Customer to identify data conversion requirements and jointly develop a Data Conversion Plan, including a Legacy Data Catalog

Customer Responsibilities:
- Work with Intergraph to identify data conversion requirements and jointly develop a Data Conversion Plan, including a Legacy Data Catalog
- Provide Legacy Data Catalog items (Entity Relationship Diagrams, and Data Dictionaries) for each system to be converted
- Provide Subject Matter Experts to assist Intergraph during this analysis process
- Ensure that selected Subject Matter Experts understand the legacy data and can explain how the data is used, as well as the data definition of the various tables/columns/pick lists

Completion Criteria:
This task is considered complete when the Data Conversion Analysis is completed and the Data Conversion Plan has been delivered.
51. LRMS INTERFACE CONTROL DOCUMENTATION (ICD) REVIEW AND SUBMITTAL

The Interface Descriptions in Attachment D provide a high-level overview of the interfaces that Intergraph will develop as part of the System. The goal of this task is to identify and obtain the specific information needed to configure the interfaces described in Attachment D. The Customer will provide a point of contact for all Customer hardware and software components with which the Intergraph deliverables will interface. The Customer will also, to the extent that it can, introduce Intergraph to third parties, including other vendors, state agencies, and local agencies that control products and/or databases with which Intergraph products are to be interfaced. Intergraph is responsible for ensuring that the third-party points of contact are the appropriate sources of information needed to develop the ICDs and for mutually agreeing with the third-party vendors on the operational and technical interface requirements.

Intergraph will interview points of contact, research interface requirements, and gather any available documentation that can clarify data schema, protocols, and query specifications. It will develop draft ICDs, which it will provide to the Customer for review. The Customer will review the functional content of the ICDs and provide feedback to Intergraph. After receiving feedback from the Customer on the draft ICDs, Intergraph will finalize the ICDs and deliver the final documents to the Customer for approval of the functional content of the ICDs. Intergraph is responsible for ensuring the technical accuracy of the ICDs.

Intergraph Team Participation:

- Project Manager
- LRMS Interface Lead

Customer Team Participation:

- Project Manager
- Subject Matter Experts

Prerequisites:

- Completion of Business Process Analysis Task
- Customer to provide Intergraph with interface-related documentation
- Completion of LRMS Detailed Requirements Analysis, if purchased

Deliverables:

- Interface Control Documentation

Intergraph Responsibilities:

- Lead the interface requirements gathering process, tracking outstanding items requiring resolution
- Convene with Customer and third-party points of contact to gather information required to develop ICDs
- Ensure that third-party points of contact are appropriate sources of information necessary to develop ICDs
- Mutually agree with the third-party vendors on the operational and technical interface requirements
- Gather all commercially available interface detailed schema, protocols, and query specifications, as needed
- Prepare draft ICDs and submit to Customer for feedback
- Incorporate Customer feedback into draft ICDs
- Finalize ICDs for Customer review and approval
Customer Responsibilities:

- Provide points of contact who are knowledgeable of the workflow and data requirements for each Customer hardware and software component with which Intergraph deliverables will interface.
- To the extent that it has access to the information, provide Intergraph with schema, protocols, and query specifications for Customer hardware and software components with which Intergraph deliverables will interface.
- To the extent that it is able to do so, introduce Intergraph to a primary point of contact for third parties, including other vendors, state agencies, and local agencies that control products and/or databases with which Intergraph products are to be interfaced.
- Provide any additional hardware or software that a third party requires for an interface with the third-party system to operate properly.
- Respond to Intergraph questions and requests for information in a timely manner.
- Ensure that design decisions are made conclusively and in a timely manner.
- Review draft ICDs and provide Intergraph feedback on any necessary changes or updates within ten (10) business days of receipt.
- Review and approve the functional content of the final ICDs.

Completion Criteria:

This task is considered complete when the Customer has reviewed and approved the functional content of the finalized ICDs.

52. LRMS/FBR PRODUCT CUSTOMIZATIONS DESIGN (IF PURCHASED)

Note: The COTS LRMS, FBR, and CAGIS applications will meet the majority of the Customer’s RFP requirements. Currently there are no inPURSUIT customizations priced; therefore, this task is applicable only if customizations result from the BPA or other project implementation activities. If customizations are identified, Intergraph will provide a quotation and change order. As an alternative approach, the County may implement FBR customizations themselves by purchasing the FBR API and associated training and consulting services.

If purchased, during the LRMS/FBR Customizations Design task, Intergraph will develop designs for FBR custom forms, LRMS customizations and any additional customizations identified during the LRMS Detailed Requirements Analysis task and confirm with the Customer that the designs are consistent with its expectations.

Intergraph will develop design review materials, including GUI layouts, FBR mock-up input forms, and FBR output report designs for the procured customizations. Intergraph will present the customization designs during a three (3) day, on-site Design Review with the Customer. Intergraph will document all feedback and decisions provided by the Customer during this review in a “Design Review Decision Document.”

Intergraph Team Participation:

- LRMS Business Analyst
- LRMS Technical Lead
- LRMS Software Engineers
Project Manager

Customer Team Participation:
- LRMS Core Team
- SMEs included in portions of the meeting, as required
- Project Manager

Prerequisites:
- Completion of LRMS Detailed Requirements Analysis

Deliverables:
- Design Review (3 days)
- Design Review Materials
- Design Review Decision Document

Intergraph Responsibilities:
- Develop a high-level system design, depicting the information flows between all system components
- Develop design for any significant customizations that are procured, such as FBR custom forms or new LRMS modules
- Develop materials for the Design Review
- Conduct an on-site Design Review (3 days)
- Document Design Review Decisions

Customer Responsibilities:
- Coordinate meetings with Intergraph, as required
- Identify the appropriate Subject Matter Experts for the Design Review (note that appropriate attendees have the authority to make requirement and design decisions)
- Ensure the Subject Matter Experts are available to participate in the Design Review meeting
- Review and approve any design materials, as required

Completion Criteria:

This task is considered complete when the Customer has reviewed and accepted the Design Review Decision Document.
53. LRMS/FBR Configuration Training

Once Intergraph has installed the COTS software, it will conduct the LRMS/FBR Configuration Training course. The purpose of this two (2) day course is to inform the LRMS Core Team and System Administrators about the configuration tools they have within the system, as well as the configuration decisions they will need to make. Examples of decisions include:

- What modules will go live at the initial cutover?
- What Security Permission Groups are required?
- What are the security requirements for each module?
- What security lock groups are required?
- What user-defined fields are required?
- What workflows need to be defined in LRMS and FBR?
- What screen configurations are required?

The LRMS/FBR Configuration Training course will instruct the LRMS Core Team and System Administrators how to use built-in configuration tools. This training will enable them to start configuring the system. This will give the Customer the opportunity to establish user accounts, define security permission groups, define security lock groups, populate code tables, define LRMS Workflows, and configure aspects of the LRMS GUI prior to system testing and end-user training.

The LRMS/FBR Configuration Training course will also educate the LRMS Core Team and System Administrators on the FBR workflow configuration requirements. It will prepare the Customer for the task of defining FBR roles and workflow (report approval) processes.

Intergraph will provide a more detailed System Administrator Training course later in the project lifecycle.

**Intergraph Team Participation:**
- Configuration Trainer
- LRMS Project Manager

**Customer Team Participation:**
- LRMS Core Team, including System Administrators
- Project Manager

**Deliverables:**
- LRMS/FBR Configuration Training Course (3 days)
- LRMS System Administrator Manual
- FBR Configuration Template

**Prerequisites:**
LRMS Business Process Analysis
COTS Product Installation in Production Environment

**Intergraph Responsibilities:**
- Conduct LRMS/FBR Configuration Training course (2 days)
- Provide documentation required to support the Customer in their configuration tasks

**Customer Responsibilities:**
- Identify LRMS/FBR Configuration Training attendees
- Provide the LRMS/FBR Configuration Training facility, which includes one workstation per attendee; one instructor workstation; and a projector
- Ensure LRMS/FBR Configuration Training attendees attend the full two (2) days of the training session

**Completion Criteria:**
This task is considered complete at the conclusion of the LRMS/FBR Configuration Training session and upon delivery of the LRMS System Administration Manual and the FBR Configuration Template.

### 54. CUSTOMER CONFIGURATION OF LRMS

During this task, the LRMS Core Team and System Administrators will configure the LRMS. For example, they will have the ability to define the following:

- Security Permission Groups and Permissions
- Record Locking Groups
- Organization Chart Security Settings
- Code Table Values for every Drop-Down Field
- Screen Configurations (field names, field colors, field mandatory settings, field visibility, etc.)
- User-defined Fields
- Workflow Management Groups and Processes

The LRMS contains many “drop-down menus,” which are populated by master code tables. The Customer is responsible for populating these code tables with allowable code values. If electronic versions of codes are available in legacy systems, Intergraph can import the code tables as part of the data conversion.

The LRMS also provides a Customization Toolbox, which enables the Customer to configure aspects of the system, including the following:

- Screen Field Titles
- Mandatory Fields Definitions
- Field Colors
- Field Tab Orders
The Workflow Management Utility provides a powerful tool for the Customer to control the flow of information throughout the LRMS. The Customer has the flexibility to define its Workgroups and the Workflows for each LRMS module.

**Intergraph Team Participation:**
- Configuration Trainer
- LRMS Business Analyst
- Project Manager

**Customer Team Participation:**
- LRMS Core Team, including System Administrators
- Subject Matter Experts
- Project Manager

**Prerequisites:**
- LRMS Business Process Analysis
- COTS Product Installation in Production Environment
- LRMS/FBR Configuration Training

**Deliverables:**
- Intergraph remote services

**Intergraph Responsibilities:**
- Provide guidance to the Customer, as needed

**Customer Responsibilities:**
- Populate the LRMS code tables
- Establish LRMS user accounts and security permissions
- Configure the LRMS Workflow Management component
- Implement any desired configurations available within the LRMS Customization Toolbox utility
- Define any desired User Defined fields
- Enter employee data into the Master Employee Index module
Completion Criteria:
This task is considered complete when the Customer has configured the LRMS and the LRMS is ready for end-user training. For end-user training to commence, Intergraph recommends the Customer complete, at a minimum, the following configuration tasks:

- Population of LRMS code tables
- Security Permission Group definitions
- Field label changes set using the Customization Toolbox
- Field visibility changes set using the Customization Toolbox
- Mandatory field definitions set using the Customization Toolbox
- User defined field definitions
- LRMS Workflow definitions

Note that while configuration is an ongoing task continuing even after system cutover, the Customer should define the above minimum configurations before starting end-user training.

55. LRMS/FBR PRODUCT CUSTOMIZATIONS DEVELOPMENT (IF PURCHASED)

During this task, Intergraph will develop any customizations approved during the LRMS/FBR Customizations Design Task. Intergraph will install and test the customizations in the Production Environment. The LRMS/FBR Subsystem will be ready for Functional Testing upon completion of this task.

Note: The COTS LRMS, FBR, and CAGIS applications meet the majority of the Customer’s RFP requirements. Currently, there are no inPURSUIT customizations priced; therefore, this task is applicable only if customizations result from the BPA or other project implementation activities. If customizations are identified, Intergraph will provide a quotation and change order. As an alternative approach, the County may implement FBR customizations themselves by purchasing the FBR API and associated training and consulting services.

Intergraph Team Participation:
- LRMS Lead
- LRMS Software Engineers
- LRMS QA Specialists
- Project Manager

Customer Team Participation:
- LRMS Core Team, including System Administrators
- Subject Matter Experts
- Project Manager

Prerequisites:
- LRMS/FBR Customizations Design
Deliverables:
- Customized LRMS application
- Customized FBR application

Intergraph Responsibilities:
- Participate in Technical Interchange Meetings to discuss design and implementation of required product customizations
- Implement procured LRMS and FBR customizations
- Conduct internal unit, integration, and regression testing at Intergraph

Customer Responsibilities:
- Review customizations and provide feedback, as required

Completion Criteria:
This task is considered complete when Intergraph has deployed and tested the customized LRMS and FBR applications in the Production environment.

56. FBR WORKFLOW CONFIGURATION

The FBR enables each report type (i.e., Incident Report, Field Interview, Crash Report, etc.) to have its own approval workflow. During this task, Intergraph will work with the Customer to identify the required FBR approval workflow processes for each FBR report type, as well as to define the roles (e.g., Officer, Supervisor, Records, etc.) the Customer will assign users within the FBR. To facilitate this process, Intergraph will provide the Customer with an FBR Configuration Template. The Customer will use this template to identify the FBR workflow roles and processes. Once the Customer has completed the FBR Configuration Template, Intergraph will configure the FBR Workflow component accordingly.

Intergraph Team Participation:
- LRMS Business Analyst
- LRMS Software Engineers
- LRMS QA Specialists
- Project Manager

Customer Team Participation:
- LRMS Core Team, including System Administrators
- Subject Matter Experts
- Project Manager
**Prerequisites:**
- Completion of Business Process Analysis
- Completion of Detailed Requirements Analysis
- Completion of LRMS/FBR Configuration Training

**Deliverables:**
- FBR Configuration Template
- Configured FBR Workflow Component in Production Environment

**Intergraph Responsibilities:**
- Provide a blank FBR Configuration Template to the Customer, along with instructions for completing
- Support the Customer, as required, as it documents the FBR Workflow requirements in the FBR Configuration Template
- Review the FBR Configuration Template for completeness and accuracy and clarify any issues with the Customer
- Configure the FBR Workflow in the Production environment, per the completed FBR Configuration Template
- Conduct FBR Workflow testing in the Production environment

**Customer Responsibilities:**
- Complete the FBR Configuration Template

**Completion Criteria:**
This task is considered complete when the agreed upon FBR Workflow has been configured and deployed in the Production environment and is ready for testing.

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**57. LRMS Interface Development**

During this task, Intergraph will develop the LRMS interfaces per the approved ICDs. Once the interfaces have passed Intergraph's internal testing, the interface software will be ready for on-site installation and testing in the Production environment.

**Intergraph Team Participation:**
- LRMS Technical Lead
- LRMS Interfaces Lead
- LRMS Software Engineers
- LRMS QA Specialists
- Project Manager
Customer Team Participation:

- LRMS Core Team
- SMEs, as Required
- Third Party Interface Stakeholders
- Project Manager

Prerequisites:

- Customer review and approval of the Interface Control Documents
- Operation or availability of the external system or third-party software

Deliverables:

- Interface software deployed to the Production environment for testing

Intergraph Responsibilities:

- Work with the required stakeholders to review interface requirements and design interfaces
- Develop interface use cases
- Develop interface test cases
- Develop interface software
- Conduct internal interface testing, prior to deployment in the Production environment
- Install interface software in the Production environment and conduct integration testing

Customer Responsibilities:

- For custom interfaces, ensure the required internal and third party stakeholders are available to work with Intergraph to design interfaces, develop interface software, and test interface software
- Provide Subject Matter Expertise to Intergraph, as needed
- Verify the physical connectivity between the Customer’s servers, remote agency servers, and external servers
- Provide the following values to Intergraph:
  - IP addresses for remote databases
  - Socket value for remote systems
  - Operator IDs (ORIs, terminal mnemonics, as needed by remote systems
- Provide support from the Customer System Administrator to the Intergraph Team, as needed

Completion Criteria:

This task is considered complete when each interface is installed and tested in accordance with the mutually agreed to Interface Control Documents.
58. LRMS DATA CONVERSION – DEVELOPMENT AND TESTING

At the completion of the Data Conversion Analysis, the following activities will be completed.

Data Mapping
Intergraph and the Customer will work together to map legacy data fields to corresponding fields in the LRMS database. During the mapping process, detailed discussions will occur between the Customer and Intergraph to resolve issues and questions regarding field mapping. At the completion of the data mapping process, Intergraph will facilitate a joint design review meeting via a conference call. The goal of the review is to provide all parties the opportunity to review any outstanding questions and jointly agree on necessary changes.

Data Conversion Scripting
Intergraph will use a combination of data conversion tools and custom script development to create scripts based on the data mapping.

Conversion Audits
Intergraph will convert a representative sample of legacy data into the LRMS database. The audit will focus on uncovering any legacy data or conversion script problems. Prior to this task, the Customer will need to provide Intergraph with a sample of legacy data large enough to allow Intergraph and the Customer to perform a quality audit on the imported data. Intergraph is not responsible for the quality of any supplied data, but will report any discovered data errors or omissions to the Customer for resolution.

Intergraph will convert the representative sample of legacy data into the LRMS Production database. Since Intergraph may be converting multiple legacy systems, Intergraph and the Customer will require an individual audit for each legacy system. The final audit will include the conversion of all legacy systems. The audit steps for each legacy system include the following:

- Intergraph will execute the data conversion scripts in the Production database using the exported legacy data provided by the Customer
- Intergraph will perform the first level of validation to ensure the scripts execute completely. This validation includes reviewing the converted data within the LRMS modules, as well as conducting conversion audit counts
- Intergraph will alert the Customer that the data is ready for review
- The Customer will review the converted data within the inPURSUIT RMS. The Customer will also compare records in its legacy system against the converted records in inPURSUIT RMS, reviewing several records within each type of RMS functional area (i.e., Master Name, Master Vehicle, Incident, Case Management, Accident, Citation, Field Interview, etc.). This review includes a detailed review of the data fields in the legacy system and the inPURSUIT RMS
- Intergraph will provide the Customer with a Data Conversion Audit Document to track issues it finds during the audit. The Customer will provide the document to Intergraph after the review. Intergraph will then investigate any found issues and schedule one or more telephone calls with the Customer to discuss findings and outcomes
- During the telephone calls to discuss data conversion issues, Intergraph will record decisions regarding the resolution of issues discovered during the audit in a Data Conversion Audit Document, which will be attached to the Data Conversion Plan and used as a living document to ensure that requests regarding data
conversion are addressed

- Intergraph will revise the data conversion scripts, as required, to address the confirmed issues

These steps will be repeated multiple times throughout the data conversion process, until all parties agree the legacy system conversion is complete and accurate.

Once the individual audits of each legacy system have been completed, Intergraph will conduct a “trial” full conversion with sample data from every legacy system to be converted. Intergraph will follow the same steps identified above for this full conversion audit.

**Intergraph Team Participation:**
- LRMS Data Conversion Lead
- LRMS Data Conversion Engineers
- Project Manager

**Customer Team Participation:**
- Legacy System(s) SMEs
- Legacy System Administrator(s)
- Project Manager

**Prerequisites:**
- Completion of the Data Conversion Analysis

**Deliverables:**
- Legacy data converted to the LRMS database for Customer Audit
- Data Conversion Audit Document

**Intergraph Responsibilities:**
- Work jointly with the Customer to map data elements from each legacy system to the inPURSUIT LRMS database
- Develop data conversion scripts/software
- Conduct multiple audit conversions for each legacy system to test the data conversion scripts
- Conduct a final audit conversion that includes all legacy systems
- Maintain a Data Conversion Audit Document for tracking data conversion issues throughout the conversion iterations

**Customer Responsibilities:**
- Provide Subject Matter Experts to assist Intergraph in mapping data elements from the legacy systems to the inPURSUIT RMS database
- Ensure that selected Subject Matter Experts understand the legacy data and can explain how the data is used as well as the data definition of the various tables/columns/pick lists
provide legacy data standards in writing, if they are to be enforced by the conversion scripts (i.e., Master Name Matching Rules, Address Validation Rules, etc.)

- Conduct any required "data cleansing" processes, before providing the legacy data export to Intergraph
- Export the legacy data and provide it to Intergraph in an ODBC compliant database
- Deliver usable legacy data to Intergraph in an ODBC-compliant format
- The SMEs may need to provide more data or scrubbed data based on feedback from the Intergraph Data Conversion Engineers
- Validate the converted data throughout the data conversion testing process

Completion Criteria:
This task is considered complete when all Parties agree that the legacy system conversion is complete and accurate.

59. LRMS/FBR FUNCTIONAL TEST DEVELOPMENT

Per the Acceptance Test Plan in Attachment G, Intergraph will provide our Standard Functional Acceptance Test Plan to formally verify system functionality. Intergraph will also include test procedures that verify the LRMS and FBR Performance Criteria. The Customer will review the Standard Acceptance Test Plan and can add additional site-specific scenarios and tests, as long as the scenarios and tests comply with the Customer’s original functional requirements. Intergraph will review all site-specific scenarios and tests added by the Customer. Intergraph and the Customer will mutually agree upon the final Functional Acceptance Test.

The Functional Test criteria and scenarios will include cases to test the ability of the CAD/MPS and LRMS/FBR Subsystems to work together as intended. The focus of these criteria and scenarios will be on accessing and transferring data between the two Subsystems. Intergraph and the Customer will have input into these integration scenarios.

At the conclusion of the Functional Test development, the Customer will have the ability to use the Functional Tests to perform independent testing of the LRMS, FBR and LRMS interfaces prior to the formal on-site Functional Testing Process with Intergraph. Intergraph recommends that the Customer perform the independent testing to validate the Functional Test scenarios and submit any potential changes to Intergraph before formal testing begins.

Intergraph Team Participation:
- LRMS Technical Lead
- Project Manager

Customer Team Participation:
- LRMS Core Team
- Project Manager

Prerequisites:
- Completion of the Interfaces Configuration Documentation Review and Submittal
- Completion of LRMS/FBR Customizations Design
Completion of LRMS/FBR Configuration Training

**Deliverables:**
- Intergraph remote services
- Functional Tests

**Intergraph Responsibilities:**
- Provide the Standard Functional Acceptance Test Plan
- Review and approve Customer revisions to the Functional Tests
- Provide input into the Standard Functional Acceptance Test Plan including scenarios that test the integration between the CAD/MPS and LRMS/FBR Subsystems
- Review and approve Customer revisions to the Standard Functional Acceptance Test Plan including scenarios that involve the integration between the CAD/MPS and LRMS/FBR Subsystems

**Customer Responsibilities:**
- Review the Standard Functional Acceptance Test Plan provided by Intergraph and add any additional site-specific test scenarios desired by the Customer

**Completion Criteria:**
This task is considered complete when the Customer and Intergraph have approved the final Functional Test Plan.

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**60. LRMS/FBR Integration and Testing by Intergraph**

Once the LRMS/FBR Customizations and Interfaces have been tested internally at Intergraph’s facility, Intergraph will install them in the Production environment. Intergraph will then conduct integration and additional testing activities to ensure all components are operating as designed. This level of testing is performed by Intergraph and third-party interface stakeholders. It will occur prior to the formal LRMS/FBR Subsystem Functional Testing. Intergraph will perform the majority of this task remotely.

**Intergraph Team Participation:**
- LRMS Technical Lead
- LRMS Software Engineers
- LRMS QA Specialists
- LRMS Interfaces Lead
- Project Manager

**Customer Team Participation:**
- IT Resources
- Project Manager
Prerequisites:
- Completion LRMS/FBR Customization Development
- Completion of Interface Development

Intergraph Responsibilities:
- Deploy customized LRMS and FBR applications to the Production environment
- Deploy interfaces to the Production environment
- Conduct integration and testing activities remotely

Customer Responsibilities:
- Provide IT support, as required

Completion Criteria:
This task is considered complete when Intergraph has completed its integration and testing activities and notifies the Customer that the LRMS/FBR Subsystem is ready for Functional Testing.

61. LRMS/FBR SUBSYSTEM FUNCTIONAL TESTING

Per the Acceptance Test Plan in Attachment G, the Customer, with on-site assistance from Intergraph, will conduct Functional Testing to confirm LRMS/FBR Subsystem functionality using the mutually developed Functional Test Plan. The Customer will verify the operability of each functional item using a scenario or test case. Intergraph and the Customer will jointly document and track the results of the test as either pass or fail. Intergraph will have up to ten (10) days to correct any functional item that fails a test, or provide a mutually acceptable written explanation of when the failed item will be corrected. The Customer has the right to conduct additional Functional Testing following any corrections.

Intergraph Team Participation:
- LRMS Technical Lead
- LRMS Interface Lead
- Project Manager

Customer Team Participation:
- LRMS Core Team
- Project Manager

Prerequisites:
- Successful completion of all prior LRMS/FBR-related tasks
- Completion of Intergraph internal LRMS/FBR Integration and Functional Testing and mutual confirmation by the Customer and Intergraph that the LRMS/FBR Subsystem is ready for testing
- Development of Functional Tests
Deliverables:

- Intergraph on-site services

Intergraph Responsibilities:

- Certify the basic system capabilities as part of Intergraph standard software certification procedures
- Certify all applicable software, systems, and ancillary systems including the redundancy of production system as ready for LRMS/FBR Functional Testing
- Provide on-site assistance during the Functional Testing
- Review any discrepancies found by the Customer during the Functional Testing
- Correct any functional item that fails a test, or provide a mutually acceptable written explanation of when Intergraph will correct the failed item

Intergraph Responsibilities

- Provide on-site assistance during the Functional Testing of Subsystem integration
- Review any discrepancies found during the Functional Testing as they apply to Subsystem integration
- Correct any functional item related to Subsystem integration that fails a test

Customer Responsibilities:

- Execute Functional Testing
- Track and document test results

Completion Criteria:

This task is considered complete when the Customer has provided acknowledgement that the LRMS/FBR Subsystem operates in accordance with the Functional Tests and Intergraph has either remedied items that failed the test or provided a mutually acceptable written explanation of when Intergraph will correct the failed items.

62. LRMS BUILD TEST/TRAINING SYSTEM

Once the LRMS/FBR Subsystem has been demonstrated to operate in accordance with the Functional Tests, Intergraph will replicate the Production environment into the Test/Training environment. Intergraph will be responsible for building the Test/Training environment, which it will do both on-site and remotely.

The Customer and Intergraph will work together to develop mutually acceptable test-case scenarios appropriate to the Test/Training environment to ensure it operates as intended.

After Intergraph has built the Test/Training environment, the Customer and Intergraph will conduct the tests. The Customer and Intergraph will document and track Failures. Intergraph will be responsible for correcting Failures. Cutover cannot occur until Intergraph has corrected Failures and the Subsystem as a whole passes the tests indicating that the Subsystem will operate as intended in the Test/Training environment and/or mutually acceptable remedies for the Failures have been developed.
The Customer reserves the right to conduct tests on a corrected Test/Training Environment to ensure that the Failure was corrected and the Environment operates as intended.

**Intergraph Team Participation:**

- LRMS Lead
- LRMS Software Engineers
- LRMS QA Specialists
- Project Manager

**Customer Team Participation:**

- IT Resources
- Project Manager

**Prerequisites:**

- Completion of Functional Testing

**Deliverables:**

- Intergraph on-site services and remote services
- LRMS/FBR System installed and tested in the Test/Training Environment

**Intergraph Responsibilities:**

- Install the LRMS/FBR system in the Test/Training environment and conduct testing to ensure the Environment operates as intended
- Correct any Failures before System Cutover

**Customer Responsibilities:**

- Provide IT support as required
- Develop scenarios to test that the Test/Training Environment operates as intended
- Document Failures

**Completion Criteria:**

This task is considered complete when the LRMS/FBR Subsystem has been installed in the Test/Training Environment and Intergraph and the Customer both agree that the Test/Training Environment operates as intended.
63. **LRMS Product Documentation**

Intergraph will deliver the technical and end-user documentation listed under the “Deliverables” section below. To enable the Customer to copy and distribute the documentation, Intergraph will deliver documentation in electronic format. As required, the product documentation will be tailored to include any customizations purchased by the Customer, such as custom FBR forms; however, Intergraph will not customize the documentation to match the Customer's system configurations.

**Intergraph Team Participation:**
- LRMS Documentation Manager
- Project Manager

**Customer Team Participation:**
- LRMS Core Team
- Project Manager

**Prerequisites:**
- LRMS Product Customizations and Testing
- Interface Development and Testing

**Deliverables:**
Intergraph will deliver the following *inPursuit* product documentation:

- **System Administration/Technical Documentation:**
  - LRMS System Administrator Manual (3 hardcopies, electronic copy)
  - FBR System Administrator Manual (3 hardcopies, electronic copy)
  - LRMS Client Installation Manual (3 hardcopies, electronic copy)
  - FBR Client Installation Manual (3 hardcopies, electronic copy)
  - Crime Analysis Geographical Information System Client Installation Manual (3 hardcopies, electronic copy)
  - Generic Query Application Programming Interface (API) Technical Manual (3 hardcopies, electronic copy)
  - Named Query Application Programming Interface (API) Technical Manual (3 hardcopies, electronic copy)
  - Help Desk and Trouble Shooting Guide (3 hardcopies, electronic copy)
  - LRMS Entity Relationship Diagram (electronic copy)
  - Data Dictionary (electronic copy)

- **User Documentation:**
FBR User Manual (3 hardcopies, electronic copy)
- LRMS User Manual (1 hardcopy, electronic copy)
- LRMS Global Navigation Features Guide (3 hardcopies, electronic copy)
- National Incident Based Reporting (NIBRS) Manual (3 hardcopies, electronic copy)
- Crime Analysis Geographical Information System User Manual (3 hardcopies, electronic copy)

**Intergraph Responsibilities:**

- Customize Product Manuals, as required, to reflect customizations purchased by the Customer
- Deliver the product documentation listed above

**Customer Responsibilities:**

- N/A

**Completion Criteria:**

This task is considered complete upon delivery to the Customer the product documents listed above under the “Deliverables” section.

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### 64. LRMS/FBR Train-the-Trainer Training

Intergraph will provide LRMS/FBR Train-the-Trainer courses per the Training Curriculum in Attachment E. The Training curriculum includes Train-the-Trainer courses designed to prepare Customer trainers for end-user training and Administration courses designed to prepare Customer technical personnel to operate and support the LRMS/FBR System.

As the Customer trainers complete Train-the-Trainer courses, they will conduct end-user training for the RMS, FBR, and CAGIS Subsystem. Intergraph assumes that the Customer will conduct concurrent training sessions to minimize the time between training and operational use of the systems in the live environment. It is the Customer's responsibility to ensure that the majority of end-users are trained prior to Cutover. The Customer and Intergraph will mutually agree upon the level of end-user training that the Customer needs to complete before Cutover, and the Customer agrees to fulfill its obligation to train that level of users. Final System Acceptance will not be withheld due to Customer not completing its training obligations.

**Intergraph Team Participation:**

- LRMS Training Manager
- LRMS Trainers
- Project Manager
Customer Team Participation:

- Designated Customer Trainers
- LRMS Core Team
- Project Manager

Prerequisites:

- Completion of Functional Testing
- Installation and testing of the LRMS/FBR in the Testing/Training environment
- Delivery of Product Documentation

Deliverables:

- Intergraph on-site training services
- Intergraph will deliver the following training courses:
  - RMS/FBR Configuration Training - priced per session (Max of 10 Students / 2 days)
  - RMS/FBR System Admin Training Course-per class (Max 5 Administrators/4 days)
  - RMS Train-The-Trainer (Max 10 Students/ 8 days)
  - FBR Train-The-Trainer -per class (Max 10 Students/2 days)
  - Web Report Server/Ad Hoc Utility Train-The-Trainer, (Max 10 students/2 days) – See Task 63
  - Crime Analysis Training (Max 10 Students / 2 days; includes 1/2 day of System Admin Training) – See Task 64

Intergraph Responsibilities:

- Provide LRMS/FBR training for Customer Technical and Training staff members for all installed LRMS/FBR software per a mutually agreed to schedule and as defined in the Pricing Detail and Deliverables Summary in Exhibit A of the Agreement and the Training Curriculum in Attachment E
- Provide one (1) complete set of printed training materials per student in classes conducted by Intergraph (note that printed training materials will not include the User Manual, which, due to its large size, will be provided in electronic format only)
- Provide machine-readable documents in Microsoft Word, based upon Intergraph’s documentation standard at the time of delivery. Documentation files will not be password protected
Customer Responsibilities:

- Designate and assign personnel to receive training in groups not to exceed the class size listed in the Training Curriculum in Attachment E
- Provide the facilities, supplies, and equipment necessary to support training classes, including one full-function workstation per student, one full-function workstation for the instructor, an LCD, a projection screen, a whiteboard and connectivity to the server
- Provide sufficient copies of the documentation supplied by Intergraph to support all students in the training classes
- Ensure that appropriate Customer Training personnel and system administrator are available to actively participate in the scheduled training programs and attendees attend scheduled training classes in their entirety
- Ensure that Customer personnel to receive LRMS/FBR training are proficient Microsoft Windows users
- Provide end-user training to users of the system

Completion Criteria:

This task is considered complete upon conclusion of the scheduled System Administrator and Train-the-Trainer courses as per the Training Curriculum in Attachment E, and the completion of Customer-led end-user training as agreed to by the Customer and Intergraph.

65. Web Based Report Server / Ad Hoc Report Builder Train-the-Trainer

The objective of this task is to instruct students how to access, generate, and schedule reports that have been created and saved to the Report Server. Additionally, the course will provide training on the development of ad hoc reports and the deployment of reports to the Report Server. Per the training curriculum in Attachment E, Web-based Report Server / Ad Hoc Report Builder training will cover the following topics:

- Overview of the Report Server Functionality
- Accessing the Ad Hoc Report Server
- Creating Ad Hoc Reports
- Report Query Editor
- Report Server Editor Sort Option
- Report Server Editor Filter Option
- Filter Condition Editor
- Create reports incorporating features
- Accessing Existing Reports
- Report Manager
- Scheduling Reports
- Publishing Reports
- Emailing Reports
- Ad Hoc Report Writer
- Deploying Reports to the Report Server
- Testing Reports in the Report Server
- Installation and Security Configuration
- Installation
- Security Configuration of the Report Server
- Permission Groups and User Security

**Intergraph Team Participation:**

- Training Lead
- Project Manager

**Customer Team Participation:**

- RMS System Administrator(s)
- Report Writers
- Project Manager

**Prerequisites:**

- Completion of LRMS/FBR Configuration Training
- Completion of LRMS/FBR System configuration
- Completion of LRMS/FBR Train-the-Trainer Training

**Deliverables:**

- On-site training Services for Web-based Report Server / Ad Hoc Report Builder
- Training Materials for Web-based Report Server / Ad Hoc Report Builder

**Intergraph responsibilities:**

- Provide two (2) days of training services.
- Provide training documentation

**Customer responsibilities:**

- Designate and assign up to ten (10) Customer personnel to receive training
Ensure that appropriate Customer personnel are available to actively participate in the scheduled training program and attend scheduled training class in their entirety. Attendees should have some prior level/knowledge of report writing, knowledge of Windows operating systems administration, basic Understanding of County’s LAN and Mobile Network Infrastructure. It is strongly recommended that students have a general understanding of SQL and relational database design.

Ensure that any workstations to be used for the training are fully installed and functional prior to class.

**Completion Criteria:**

The task is considered complete at the conclusion of the Web-based Report Server / Ad Hoc Report Builder training.

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**66. CRIME ANALYSIS TRAIN-THE-TRAINER**

The objective of this task is to instruct students to display incident data via an ESRI-based Crime Analysis tool, define and zoom in on specific crime hot spots, build a comprehensive picture of crime trends, develop custom queries, and generate and analyze Trend Analysis reports. Per the training curriculum in Attachment E, Crime Analysis training will cover the following topics:

- Mapper/Analyst Functions
- Using a Stored Query to Generate a Crime Map
- Generating and Saving a Wizard Driven Query
- Jurisdiction, Geographical Area, Post
- Querying By Date/Time
- Crime Types and Status, Property, MO, Person and Vehicle Information
- Using Themes
- Map Viewer
- Exporting Layers and Printing Maps
- Editing and Deleting Graphics
- Jurisdictional Viewing
- Adding and Removing Shape Files for Viewing
- Additional Tools for More Advanced Analysis
- Export
- Map to Image File
- Map to Clipboard
- Save Results of a Query to a Shape File
- Printing
Intergraph Team Participation:
- Training Lead
- Project Manager

Customer Team Participation:
- RMS System Administrator(s)
- Agency Trainers
- Project Manager

Prerequisites:
- Completion of LRMS/FBR Configuration Training
- Completion of LRMS/FBR System configuration
- Completion of LRMS/FBR Train-the-Trainer Training

Deliverables:
- On-site training Services for Crime Analysis Train-the-Trainer
- Training Materials for Crime Analysis Train-the-Trainer

Intergraph responsibilities:
- Provide two (2) days of training services (includes half day of System Administration Training).
- Provide training documentation

Customer responsibilities:
- Designate and assign up to ten (10) Customer personnel to receive training
- Ensure that appropriate Customer personnel are available to actively participate in the scheduled training program and attend scheduled training class in their entirety. Attendees should have a basic knowledge of Incident Mapping Tools, Shape files, Layers, and a basic knowledge of RMS
- Ensure that any workstations to be used for the training are fully installed and functional prior to class

Completion Criteria:
The task is considered complete at the conclusion of the Web-based Report Server / Ad Hoc Report Builder training.

67. LRMS SUBSYSTEM CUTOVER PLAN

Intergraph and the Customer will jointly develop a Cutover Plan that will detail the steps necessary to move into live operations. To ensure that the move to live operations goes as smoothly as possible, the Cutover Plan will assign tasks and responsibilities to both Intergraph and Customer personnel during the final month before cutover to live operations. The Plan will cover Customer staffing, movement of equipment into final locations, final database clean out of test events, issue reporting procedures and planned sequence of events for the cutover day.
Intergraph will provide the initial draft of the Cutover Plan to the Customer for review. The Customer will review the draft and provide feedback to Intergraph, which will incorporate the feedback into a final Cutover Plan.

**Intergraph Team Participation:**
- LRMS Lead
- Interface Lead
- Training Lead
- Project Manager

**Customer Team Participation:**
- LRMS Core Team
- Project Manager

**Prerequisites:**
- N/A

**Deliverables:**
- Intergraph remote services
- Cutover Plan

**Intergraph responsibilities:**
- Create a draft LRMS Cutover Plan
- Work with Customer personnel to refine the Cutover Plan
- Review and approve the final Cutover Plan

**Customer responsibilities:**
- Review and comment on the draft LRMS Cutover Plan
- Work with Intergraph personnel to refine the Cutover Plan
- Review and approve the final Cutover Plan

**Completion Criteria:**
This task is considered complete when the Customer has reviewed and approved the final Cutover Plan.

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### 68. LRMS SUBSYSTEM CUTOVER READINESS REVIEW

The purpose of this meeting between Intergraph and the Customer is to confirm that all preparations for go-live activities have been completed. This meeting may be conducted via conference call.

The Readiness Review verifies that the following has occurred:
- Cutover Plan approval
- Pre-Cutover Testing according to the Acceptance Test Plan
- Establishment and approval of a schedule for cutover activities
- Identification and scheduling of Intergraph and Customer resources required for go-live activities
- Notification of planned system cutover to internal and external interface stakeholders supplying systems integral to go-live operations
- Data conversion audit complete and approved

**Intergraph Team Participation:**
- LRMS Lead
- Interface Lead
- Data Conversion Lead
- Project Manager

**Customer Team Participation:**
- LRMS Core Team
- Project Manager

**Prerequisites:**
- Completion of all Pre-Cutover Testing
- Completion of all end-user training designated by the Customer as being required for “go-live”
- Data conversion audits complete and final data conversion activities planned

**Deliverables:**
- Completion and acceptance of the Readiness Review

**Intergraph Responsibilities:**
- Provide above noted resources to attend Readiness Review meeting

**Customer Responsibilities:**
- Provide above noted resources to attend Readiness Review meeting
- Provide final “go-live” approval

**Completion Criteria:**
The deliverable will be completed upon conclusion of the Readiness Review meeting and documentation of Customer approval to commence with LRMS/FBR Subsystem cutover.

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**69. LRMS DATA CONVERSION – FULL “GO-LIVE” CONVERSION**
Intergraph will perform the final legacy data conversion after the data conversion testing is complete and all discrepancies have been resolved. The full conversion will begin just prior to LRMS/FBR system cutover. The Customer will halt use of all legacy systems to be converted. The Customer will perform the final legacy data exports into the agreed to ODBC-compliant formats. Intergraph will execute the data conversion software for each legacy system in the order documented in the Data Conversion Plan. The data conversion software will import the converted data into the Customer’s production RMS database. Once Intergraph has converted the legacy data into the Intergraph database, the Customer will be responsible for validating the accuracy of the conversion.

**Intergraph Team Participation:**
- LRMS Data Conversion Lead
- LRMS Data Conversion Engineers
- Project Manager

**Customer Team Participation:**
- Legacy System(s) SMEs
- Legacy System Administrator(s)
- Project Manager

**Prerequisites:**
- Completion of Data Conversion Development and Testing tasks
- Completion of Readiness Review Task

**Deliverables:**
- Full Data Conversion just prior to cutover

**Intergraph Responsibilities:**
- Perform full data conversion and place data in Production LRMS database

**Customer Responsibilities:**
- Subject Matter Experts provide any support needed to the LRMS Data Conversion Engineers during the data conversion
- Customer perform final validation of data prior to cutover

**Completion Criteria:**
This task is considered complete when the full LRMS data conversion has been completed and tested, and both the Customer and Intergraph agree that the data has been converted.

### 70. LRMS/FBR CUTOVER

Once testing is complete, and Intergraph and the Customer have held the Readiness Review meeting, Intergraph will certify the LRMS/FBR Subsystem as operational and ready for production operation. The final decision to cut over to live operations is ultimately a Customer decision; however, both Intergraph and the Customer will review system status and jointly make a recommendation to move into production. Intergraph personnel will assist the Customer in
placing the system into productive use. Upon cutover, Intergraph personnel will be on-site at least one (1) day prior
to live operations and will provide post-live on-site support for three (3) days, with on-going focused phone support
following the on-site support period. Intergraph intends to cutover both the LRMS and FBR components of the
LRMS/FBR Subsystem at the same time. Should the Customer decide to cutover LRMS a significant period of time
before the FBR Cutover, the Customer and Intergraph will need to initiate a Change Order and adjust the Project
Schedule and Payment Milestones accordingly.

Customer technical personnel must be present to provide support for the system. Customer training personnel and
core team members will be scheduled to provide knowledgeable Customer support to all shifts during the first few
days after cutover to live operations in conjunction with the scheduled Intergraph staff.

As of cutover of the LRMS, FBR and CAGIS to live operations, the Subsystem enters the extended warranty period,
and the 30-day reliability test period will begin.

**Intergraph Team Participation:**
- LRMS Technical Lead
- LRMS Interface Lead
- Customer Team Participation:
  - LRMS Core Team
  - Project Manager
  - IT Resources
  - Trainers

**Prerequisites:**
- Completion of all prior projects tasks pertaining to the implementation of the LRMS/FBR Subsystem
- Completion and acceptance of the Cutover Plan
- Completion of the Readiness Review meeting

**Deliverables:**
- Intergraph on-site services during Cutover (Intergraph personnel will be on-site at least one (1) day prior to
  live operations and will provide post-live on-site support for three (3) days
- Two (2) weeks of remote technical and training support immediately following the on-site Cutover support

**Intergraph Responsibilities:**
- Assist the Customer staff in placing LRMS/FBR into a production status
- Monitor the initial operation of LRMS/FBR and answer any operational questions raised by the Customer
- Assist the training staff in utilizing the LRMS/FBR Subsystem
- Assist the technical staff in supporting the LRMS/FBR Subsystem
- Provide remote support following on-site Cutover support

**Customer Responsibilities:**
- Place the software into production and begin operational use in consultation with Intergraph and in accordance with the Project Schedule
- Provide technical staff to support the Subsystem
- Provide training staff to answer end-user questions, in conjunction with the Intergraph staff
- Provide a detailed list of questions and issues that still require explanation or resolution by Intergraph at the end of each day

**Completion Criteria:**
This task is considered complete when the LRMS/FBR Subsystem has been cutover into live Production operations.

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**LRMS/FBR 30-DAY PERFORMANCE AND RELIABILITY TEST**

Per the Acceptance Test Plan in Attachment G, the Intergraph LRMS/FBR Subsystem will undergo a 30-day Performance and Reliability test during which the System will maintain the performance, reliability, and availability standards identified in Attachment G. See the Acceptance Test Plan in Attachment G for a description of the Performance and Reliability Criteria testing, definitions of error types, and the plan to remedy found errors.

The Customer is responsible for maintaining a log of any discovered problems. The log should contain information as to the sequence of events leading up to the problem, time of day, node name or unit involved, and other pertinent details. Intergraph is responsible for remedying found errors per the Acceptance Test Plan.

At the conclusion of the Performance and Reliability test, Intergraph will provide the Customer a final summary report documenting all issues that occurred during the thirty (30) day Performance and Reliability period, as well as the resolution activities for the issues.

**Intergraph Team Participation:**
- LRMS Lead
- Interface Lead
- Project Manager

**Customer Team Participation:**
- LRMS Core Team
- Project Manager

**Prerequisites:**
- Cutover to live operations of the LRMS/FBR system

**Deliverables:**
- Intergraph remote services
- Final summary report documenting all issues that occurred during the thirty (30) day Performance and Reliability period, as well as the resolution activities for the issues
Intergraph Responsibilities:

- Address and/or correct found errors per the appropriate resolution identified in Attachment G

Customer Responsibilities:

- Use and monitor the LRMS/FBR system in a production environment
- Maintain a log of problems found
- Contact Intergraph personnel in a timely manner in the event of system problems or failures
- Begin system monitoring in support of the Extended Warranty period

Completion Criteria:

This task is considered complete after the LRMS/FBR Subsystem successfully passes the 30-day Performance and Reliability Test per the Acceptance Test Plan in Attachment G.

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72. BUSINESS INTELLIGENCE FOR RMS IMPLEMENTATION

The Business Intelligence (BI) for RMS Solution to be provided to the Customer is composed of the following primary software components:

- Intergraph Reporting and Analysis Data Foundation for RMS — the core platform that is used to create the unique Intergraph reporting data warehouse for public safety information
- Business Objects Web Intelligence™ — a query and analysis product that provides users with self-service information access and interactivity
- Business Objects Crystal Reports™ — a report design solution that allows users to create and design presentation quality reports
- Business Objects Xcelsius Enterprise™ — a product that allows users to create next-generation data visualization tools such as dashboards for the distribution and reporting of business-critical information
- Intergraph Web Report Viewer — a solution that contains the tools and report formats that allow agencies to utilize Web-based reports and dashboards built by Intergraph to view I/CAD data

This task consists of the following items:

- Installation of the Intergraph Business Intelligence for RMS Solution and Business Objects Applications
- Installation of database software and database creation (Note: this will be accomplished either with the installation of BI for CAD or BI for RMS, whichever comes first)
- Population of the data warehouse with processed inPURSUIT RMS data
- The Business Intelligence Solution for RMS is based on a standard inPURSUIT RMS database schema. The addition of custom fields to the Business Intelligence Solution can be accommodated at an additional cost
- The Business Intelligence Solution for RMS includes standard Business Intelligence reports created for inPURSUIT RMS data. The addition of custom reports to the BI Solution can be accommodated at an additional cost
- Intergraph is not responsible for the quality of any supplied data. Intergraph will report any discovered data errors or omissions to the Customer for resolution
Intergraph Team Participation:

- RMS Lead/Business Analyst
- Project Manager

Customer Team Participation:

- RMS Core Team
- Database Administrator
- System Administrator as needed
- Network Administrator as needed
- Project Manager

Prerequisites:

- Successful cutover of RMS

Deliverables:

- Installation of the Business Intelligence Solution for RMS

Intergraph responsibilities:

- Prepare scripts for *inPursuit* RMS data population based on extracted data provided by Customer before the on-site installation
- Provide the software as defined in the Pricing Detail and Deliverables Summary in Exhibit A
- Installation of the BI Solution for RMS
- Configure the environment for the extraction of production *inPursuit* RMS data to a data warehouse to support the BI Solution. This includes all related data services including the creation of database, configuration and running of ETL scripts, populating the data warehouse, and set up RMS Universe
- Installation and configuration of standard reports to allow the viewing, querying, and reporting of the *inPursuit* RMS data

Customer responsibilities:

- Provide an extraction of the *inPursuit* RMS database not less than two weeks prior to on-site system installation.
- The Customer shall provide Intergraph with access to all relevant data, documents, plans, reports, and analyses related to the scope of work and responsibilities of this project
- Observe system installation and support as necessary
- Participate in informal knowledge transfer, as well as documentation and system review
- Confirm that the software installation and delivery has been completed by Intergraph

Completion Criteria:
This task is considered complete when the Business Intelligence for RMS Solution has been installed including the population of the inPURSUIT RMS data warehouse.

73. **BUSINESS INTELLIGENCE FOR RMS WORKSHOP AND TRAINING**

Intergraph will provide two (2) Business Intelligence for RMS Workshops to facilitate the configuration of the Business Intelligence Solution for RMS and two (2) Business Intelligence for RMS training sessions to transfer Business Intelligence knowledge to key County personnel as per the Training Curriculum in Attachment E. Before the training sessions, Intergraph will provide training materials to the Customer, which is responsible for making enough copies for each participant in each class.

**Intergraph Team Participation:**
- Project Manager
- Trainers

**Customer Team Participation:**
- RMS Core Team
- Project Manager

**Prerequisites:**
- Implementation of Business Intelligence Solution for RMS
- Delivery of training materials

**Deliverables:**
- Intergraph on-site training services

**Intergraph Responsibilities:**
- Provide Business Intelligence for RMS Workshops and Training, as defined in the Pricing Detail and Deliverables Summary in Exhibit A and the Training Curriculum in Attachment E
- Provide one (1) complete set of printed training materials

**Customer Responsibilities:**
- Designate and assign personnel to receive training in groups not to exceed the class size listed in the Training Curriculum in Attachment E
- Provide sufficient copies of training documentation to support all students in the training classes
- Provide the necessary classrooms, facilities, and copies of the materials
- Provide one full-function workstation per student, one full-function workstation for the instructor, an LCD, a projection screen, a whiteboard and connectivity to the server
- Ensure that appropriate Customer personnel are available to actively participate in the entire scheduled training programs

**Completion Criteria:**
This task is considered complete at the conclusion of the two (2) Business Intelligence for RMS Workshops and two (2) Business Intelligence for RMS Training sessions as per the Pricing Detail and Deliverables Summary in Exhibit A and the Training Curriculum in Attachment E.

74. LRMS/FBR Project Closure

During this task, Intergraph and Customer project managers will review project activities and deliverables and mutually agree that all LRMS- and FBR-related items purchased under the Contract have been delivered and are operational, all LRMS- and FBR-specific tasks are complete, major issues identified in use of the system in production have been corrected, and all Payment Milestones to-date have been met.

**Intergraph Team Participation:**
- Project Manager

**Intergraph Team Participation:**
- Project Manager

**Customer Team Participation:**
- Project Manager

**Prerequisites:**
- Completion of Statement of Work LRMS Implementation Tasks

**Deliverables:**
- Intergraph remote services
- Intergraph remote services

**Intergraph responsibilities:**
- Verify with the Customer Project Manager that all LRMS and FBR-related items purchased under the Contract have been delivered and are operational, all LRMS- and FBR-specific tasks are complete, Intergraph has resolved all P1 and P2 errors and all Payment Milestones to-date have been met

**Customer responsibilities:**
- Verify that all LRMS- and FBR-related items purchased under the Contract have been delivered and are operational, all LRMS- and FBR-specific tasks are complete, Intergraph has resolved all P1 and P2 errors, and all Payment Milestones to-date have been met
- Ensure the payment of all invoices for Payment Milestones that have been met to-date

**Completion Criteria:**
This task is considered complete upon verification by Intergraph and Customer project managers that all LRMS/FBR-related items purchased under the Agreement have been delivered and are operational, Statement of Work LRMS Implementation Tasks are complete, Intergraph has resolved all P1 and P2 errors and all Payment Milestones to-date have been met.
75. **Overall Final Project Closure**

During this task, Intergraph and Customer project managers will agree that all project related items purchased under the Contract have been delivered, Intergraph has fulfilled all obligations under the Agreement, all Statement of Work Tasks are completed, Intergraph has corrected all P1 and P2 issues and all Payment Milestones have been met. Upon verification that the task completion criteria for this task have been met, the Customer will authorize payment of the final Payment Milestone invoice.

**Intergraph Team Participation:**
- Project Manager

**Customer Team Participation:**
- Project Manager

**Prerequisites:**
- All CAD/MPS and LRMS/FBR related tasks are completed

**Deliverables:**
- Intergraph remote services

**Intergraph Responsibilities:**
- Verify with the Customer Project Manager that all items purchased under the Contract have been delivered and are operational, all project tasks are complete and Intergraph has resolved all P1 and P2 errors. Verify that the Customer has received the final Payment Milestone invoice

**Customer Responsibilities:**
- Verify that all products and services contracted for have been delivered
- Ensure the payment of the final project Payment Milestone invoice

**Completion Criteria:**
This task is considered complete upon verification by the Intergraph and Customer Project Managers that all items purchased under the Agreement have been delivered and are operational, all Statement of Work tasks are complete, Intergraph has resolved all P1 and P2 errors, and all Payment Milestones have been met.
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1 I/CAD INTERFACES

1.1 ANI/ALI INTERFACE TO EXISTING POSITRON POWER911

One (1) license of ANI/ALI is included. This license is provided with the I/CAD System at no additional cost. The ANI/ALI interface supports one-way communications from the existing Positron Power911 system to the I/CAD System.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

The I/CAD ANI/ALI Interface supports the following protocols:

- NENA format versions 1 and 2 (fixed length ASCII)
- NENA version 3 (tagged delimited)
- NENA versions 4 (XML)

The ANI/ALI interface downloads telephone company information and lights the ANI/ALI button on the Event Information dialog box and emits an audible alert to indicate that an E-911 call has been received. When the operator selects the ANI/ALI button, the software populates the Location, Phone, and Address fields of the Event Information dialog box. If the event location is different than the caller’s address, the operator can override the incorrect address by typing in the correct one.

Approach:

The proposed ANI/ALI interface is a commercial, off-the-shelf (COTS) interface that transfers data from an incoming ANI/ALI packet to the I/CAD Event Information form. By default, when the interface initially receives telephone company information, the Event Information ANI/ALI button lights, indicating that an E9-1-1 call has been received. By selecting the lit ANI/ALI button, the operator signals the I/CAD System to populate the relevant Event Information dialog box fields with ANI/ALI data. Alternately, the I/CAD System may be configured to automatically populate the Event Information dialog box with the ANI/ALI data without requiring the operator to select the ANI/ALI button.

For cases where the event location differs from the caller’s address, the operator may override the ANI/ALI location data. However, both the original E9-1-1 address and the manually entered address are retained in the Event History.

In addition to landline calls, Intergraph’s ANI/ALI interface supports FCC Phase II requirements for cellular 911 calls, which mandates that geographical coordinates associated with caller location be added to the ANI/ALI packet received by emergency communications centers. Using these coordinates, the I/CAD System displays the caller’s location on the I/CAD Map. In addition, the nearest civic address may also be estimated and displayed. The following commands are used to implement geographic representation of a wireless caller’s location:

- **Locate Call** – Because a lag of as much as 20 seconds can occur prior to the availability of geographical coordinate data from the wireless provider, initial ANI/ALI data does not typically include coordinate information. Consequently, the I/CAD System initiates a “re-bid” to pick up geographic coordinates. The I/CAD System Event Information dialog box signals the availability of re-bid data by lighting a Locate Call button, and the operator downloads the data to the appropriate Event Information fields by selecting the highlighted button

- **Automatic Address Estimation** – To enhance the usability of coordinate data in the I/CAD environment, when coordinate data populates the Event Information dialog box Location field, the Location Verify functionality automatically estimates the nearest address and cross streets and adds the estimated address as a comment in the Event Information dialog box Remarks field

Assumptions:

- Implementation assumes a TCP/IP (Ethernet) connection or an RS-232 connection to an existing ANI/ALI controller
- Intergraph assumes that the County’s ANI/ALI controller supports one of the NENA format versions listed above and that the ANI/ALI packet provided includes the caller’s telephone number, address, and the answering point of the call when answered
• The exact format of data in the ANI/ALI packet, including formats used by wireless carriers, must be provided to Intergraph by the County

• Intergraph assumes that dual ANI/ALI interfaces and implementations are required – one for the Primary Site and a second for the Backup Site

• With the exception of the Site-specific Development Services described below, Intergraph assumes that this interface will require implementation of our COTS ANI/ALI interface and will not require development. If this is not a valid assumption, Intergraph reserves the right to re-bid the interface to include development costs

• VOIP Support: As of June 3, 2005, the FCC requires that all VoIP vendors route 911 VoIP calls through the E9-1-1 infrastructure. Therefore, all VoIP calls are ultimately handled by an ANI/ALI controller. The PSAP is responsible for ensuring that their ANI/ALI controller is capable of handling the ALI database lookup for these calls. Once implemented, ANI/ALI packets for VoIP calls will be processed by the I/CAD System in the same manner as landline or cellular calls: VoIP calls that include a caller’s address will be handled like landline calls; and VoIP calls that include a coordinate location will be handled like Phase II cellular calls. If the County requires an interface that receives ANI/ALI or other data for VoIP calls outside of the ANI/ALI controller, Intergraph will bid a custom interface at additional cost

• NG-911 Support: Intergraph is closely following developments in NG-911. We are committed to implementing NG-911 by developing to accepted standards as they become available. Use of approved standards will allow us to be compatible with the many components of the evolving NG-911 system. We are monitoring and participating in the ongoing standards development effort. As active members of the NENA/APCO NG9-1-1 PSAP working group, we are participating in the NG9-1-1 CAD Interface Standards development. The I/CAD System currently meets many of the call taking requirements, detailed in the USDOTs “Next Generation 9-1-1 (NG9-1-1) System Initiative System Description and Requirements Document,” which will be superseded by the NG9-1-1 requirements and standards that are currently under development. Intergraph has extensive experience with many of the fundamental requirements of NG-911. These include large distributed systems, telephony interfaces, and display of imagery and video. We have also pioneered the development of products to communicate with other CAD systems. I/CAD’s extensive configurability will allow implementation of a user-friendly Human Machine Interface (HMI). Yet it is configurable to meet the needs of individual PSAPs. The I/CAD suite of products is well positioned to transition to NG9-1-1. I/CAD’s modularized architecture will allow the addition of viewers for new media types such as video and imagery. Architectural changes have been made to set the foundation for NG911

Constraints:

• The County must provide a complete and accurate description of the ANI/ALI controller interface, and the County assumes responsibility for the maintenance and support of hardware and software, and also of cabling required to provide the physical interface between Communications/Interface Servers #1 and #2 on Host Server #1 and #2 and the ANI/ALI controller. Intergraph’s demarcation point for responsibility of the ANI/ALI stream is at the port or socket on the Host Servers’ Communications/Interface Servers

Site Specific Development Services for ANI-ALI:

Intergraph has quoted site-specific development services to address the Confidence Factor functionality requirements in the County Request for Proposal. I/CAD can be configured to display the Confidence Factor in the event information dialog if the phone system sends the information in their packet.

Specifically the following requirements are referenced:

• CAD 21.6.2.3: Automatic map display with tower sector highlighted (Phase I), in which the map display is easily identifiable as a Phase 1 call

• CAD 21.6.2.4: X-Y latitude / longitude automatic map display including radius (Phase II)

• CAD 21.6.2.6: Confidence factor for location information (Phase II)

Assumptions:

• Assumes the 911 vendor provides the confidence factor information in the ANI/ALI feed to I/CAD
1.2 **I/TELEPHONE DEVICE FOR THE DEAF TO POSITRON POWER VIPER**

One (1) license of I/Telephone Device for the Deaf (I/TDD) is included. The I/TDD interface supports two-way communications between the telephone system controller – the existing Positron Power911 system – and the I/CAD System.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment.

I/TDD interfaces to telecommunications hardware/software for the hearing- or speech-impaired to facilitate communications between incoming TDD calls and TDD-enabled workstations. Once implemented, the I/TDD interface automatically detects TDD calls and opens a TDD form, allowing the operator to communicate with the caller via the workstation keyboard.

**Approach:**

As quoted for the County, Intergraph's I/TDD software interfaces to Positron's External TDD/TTY Interface with Power 911 Intelligent Workstations – rev 2 May 31, 2004 to automatically recognize TTY calls.

With the Positron TDD interface, when a call comes, if the call taker suspects it is a TDD Call, they answer the call through the I/TDD Client so that an interrogate message is sent to the caller. If the AutoDetect mode is enabled on the Positron side, a prompt will show the message gadget in I/TDD Client to ask the operator to answer the call.

Since AutoDetect is not available for all the calls, Auto Answer feature of I/TDD is not supported with Positron.

During the conversion of a TDD call, the text entered by the caller is shown to I/TDD Client in upper case characters, and text entered by the call taker is shown in lower case characters. The call can be switched between Voice mode and TDD mode. The operator uses the TDD Mode button or Voice Mode button to switch between TDD mode and Voice mode, and uses the Hang Up button to end a TDD call. If the call is in Voice mode when terminated, the operator still clicks the Hang Up button to notify the I/TDD Server the termination of the call.

**Assumptions:**

- Intergraph's current bid assumes that the County will provide the External TDD/TTY Interface with Power 911 Intelligent Workstations – rev 2 May 31, 2004 with the Positron Power Viper system.

**Constraints:**

- The County is responsible for providing complete and accurate documentation on the TDD interface.
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input/output formats or data requirements associated with the third-party vendor's product.

1.3 **I/INFORMER**

One (1) license of I/Informer is included. I/Informer supports bi-directional query and response services.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment.

The I/Informer interface product provides a proposed set of forms designed to run queries on local, provincial, regional, and/or national crime information databases, such as the National Crime Information Center (NCIC), or to databases associated with external applications, such as the inPursuit Law Enforcement RMS.

For Maricopa County, the I/Informer interface includes services to implement queries to the following databases and/or applications:

- MVD
- ACIC/NCIC
- NLETS
- ACJIS
- inPursuit Law Enforcement RMS
**Approach:**
I/Informer provides a standard interface that supports I/CAD System query access to external databases for workstations running the I/Dispatcher product or for mobile data terminals running the Mobile for Public Safety application.

The proposed I/Informer to MVD/AJIS/ACIC/NCIC/NLETS interface includes HTML forms configured to execute the following transactions:

<table>
<thead>
<tr>
<th>MKE Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACLA</td>
<td>Locate Stolen Article</td>
</tr>
<tr>
<td>ACLB</td>
<td>Locate Stolen Boat</td>
</tr>
<tr>
<td>ACLF</td>
<td>Locate Felony Vehicle</td>
</tr>
<tr>
<td>ACLG</td>
<td>Locate Stolen Gun</td>
</tr>
<tr>
<td>ACLL</td>
<td>Locate License</td>
</tr>
<tr>
<td>ACLM</td>
<td>Locate Missing Person</td>
</tr>
<tr>
<td>ACLP</td>
<td>Locate Stolen Part</td>
</tr>
<tr>
<td>ACLS</td>
<td>Locate Stolen Security</td>
</tr>
<tr>
<td>ACLV</td>
<td>Locate Vehicle</td>
</tr>
<tr>
<td>ACLW</td>
<td>Locate Warrant</td>
</tr>
<tr>
<td>ACQA</td>
<td>Query Article</td>
</tr>
<tr>
<td>ACQB</td>
<td>Query Boat</td>
</tr>
<tr>
<td>ACQG</td>
<td>Query Gun</td>
</tr>
<tr>
<td>ACQV</td>
<td>Query Vehicle</td>
</tr>
<tr>
<td>ACQW</td>
<td>Query Wanted</td>
</tr>
<tr>
<td>ACVR</td>
<td>Vehicle Registration</td>
</tr>
<tr>
<td>ACWI</td>
<td>Query CCW Permit</td>
</tr>
<tr>
<td>ACWL</td>
<td>10-28/10-29 Query</td>
</tr>
<tr>
<td>ADAQ</td>
<td>Aircraft Registration Query</td>
</tr>
<tr>
<td>DQ</td>
<td>Driver's License Query</td>
</tr>
<tr>
<td>GQ</td>
<td>FAA Aircraft Reg Query</td>
</tr>
<tr>
<td>KQ</td>
<td>Drivers License Query</td>
</tr>
<tr>
<td>NCI</td>
<td>Cancel Stored Vehicle</td>
</tr>
<tr>
<td>MKE Code</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>NEI</td>
<td>Enter Stored Vehicle</td>
</tr>
<tr>
<td>NIQ</td>
<td>Query Stored Vehicle</td>
</tr>
<tr>
<td>NLJK</td>
<td>LoJack</td>
</tr>
<tr>
<td>NLYQ</td>
<td>NCIC Hit Confirmation Request</td>
</tr>
<tr>
<td>NUI</td>
<td>Update Stored Vehicle</td>
</tr>
<tr>
<td>RQ</td>
<td>Vehicle Registration Query</td>
</tr>
<tr>
<td>SORI</td>
<td>Sex Offender Name Query</td>
</tr>
<tr>
<td>UQ</td>
<td>Canadian Drivers Lic Query</td>
</tr>
<tr>
<td>VQ</td>
<td>Canadian Stolen Vehicle Query</td>
</tr>
<tr>
<td>WQ</td>
<td>Canadian Wanted Person Query</td>
</tr>
<tr>
<td>XQ</td>
<td>Canadian Vehicle Regis Query</td>
</tr>
</tbody>
</table>

Additional query transactions for the I/Informer to MVD/AJIS/ACIC/NCIC/NLETS implementation may be purchased from Intergraph in sets of 5. As an alternative, the customer has the ability to develop their own HTML forms. Using these forms and VB scripting tools, the customer can create a query transaction in the exact format the external data source is expecting. I/Informer will then submit (deliver) that query transaction to the external data source and wait for a response. When I/Informer receives that response, it is routed back to the Client workstation/MDC where the query was originally submitted. See Site Specific Services Description below – Intergraph has provided OPTIONAL Pricing for additional transactions as defined below.

The implementation of nested query functionality, return of images with query responses, or XML formatting to enable consumption of the state/NCIC responses by the inPURSUIT Field Based Reporting (FBR) application incur additional costs if required for either the proposed I/Informer to MVD/AJIS/ACIC/NCIC/NLETS interface or for the proposed I/Informer to inPURSUIT interface. See Site Specific Services Description below – Intergraph has provided Pricing for support of nested queries and return of images with query responses, as well as XML formatting of responses.

Intergraph has also proposed I/Informer as the query tool to allow both I/CAD workstation and mobile users to query the law enforcement RMS database (inPURSUIT). This interface is implemented via a web service remote to interface to the inPURSUIT database. I/Informer’s role is to deliver the information from the database.

As proposed for the inPURSUIT implementation, the I/Informer interface will provide the following transactions:

- Name
- Vehicle
- Location
- Name Query By Recnum

When a Name Query is performed a hyperlinked list of names may be returned. The user can then select one of the names in the list and details will be retrieved from the inPURSUIT database by using the NameQueryByRecnum. If only 1 record is found, the name query should return all details for that 1 name without using the hyperlinked list. The Location and Vehicle query return all the details in 1 return.

Each instance of the I/Informer interface automatically routes queries and responses between clients and the external systems, and if the external database supports unique routing codes for each query and response, I/Informer may be implemented to automatically initiate queries in response to actions executed within the I/CAD System. For example, defining an event as a
vehicle stop and entering the license tag number within I/Dispatcher may automatically initiate the “Vehicle Query by License Number” to the MVD, state, and national databases. The product can be further configured to automatically enter all query results in a centralized server log, as well as to automatically attach query results to the event. Query responses may also be printed, and using the I/CAD System messaging capability, responses may be forwarded.

In addition, I/Informer provides:

- Explicit sign on and sign off using authorizations defined in the I/CAD Database
- Transaction level security, which verifies user authorization for each query type
- Hit detection that allows responses to be searched for specific text. If found, notifications can be automatically distributed based on configurable designations

Assumptions:

- Intergraph assumes that the MVD/AJIS/ACIC/NCIC/NLETS queries listed above, which are based on standard queries developed for other customer sites in the State of Arizona, will meet the County's requirements. If the County decides that additional queries are required, Intergraph will quote services to provide defined queries in sets of 5
- Intergraph assumes that queries to each database are sent through a common switch. If not, additional I/Informer licenses and implementation services may be required to service each separate database, message switch, or API
- Intergraph assumes that connection method for the DMV/AJIS/ACIC/NCIC/NLETS interface will be via MQ Series. However, Intergraph can also provide a TCP/IP connection to ACIC/NCIC

Constraints:

- Certification of any of the proposed I/Informer interfaces, if required by the host, is the responsibility of the County
- Implementation of the I/Informer to AJIS interface requires coordination between the data supplier and the customer to provide SQL statements and documentation 60 days prior to delivery of the interface
- As proposed, the I/Informer to MVD/AJIS/ACIC/NCIC/NLETS interface is a COTS implementation used for other customers in the State of Arizona. Additional services to develop custom message switch communications, as well as development of GUI and SQL statements necessary to send the transactions to MVD/AJIS/ACIC/NCIC/NLETS and receive responses back, incur additional charges. Please note that extensive testing of these interfaces is required
- The County is responsible for providing a complete and accurate description of the connection methods and the query data models for the existing I/Informer interfaces and for any hardware/software required to implement the communication interface to each external database
- Intergraph cannot be held accountable for incompatibilities that occur in the interfaces to existing applications or databases as the result of changes to input/output formats or data requirements associated with the third-party vendor’s product

**Site Specific Development Services for Informer:**

Intergraph has quoted the following Site Specific development services for the County:

- I/Informer Site Specific Development Services for ACJIS/ NCIC/ MVD/ ACIC/ NLETS (IPS0004-C)
- I/Informer Site Specific Development Services for inPursuit RMS System (IPS0004-E)
- Additional Informer Transactions (IPS0004-B) – OPTIONED – (I/Informer Site Specific Development Services for Additional ACJIS Transactions)
- I/Informer Site Specific Development Services to Support DMV images from the State (IPS0004-F)
- I/Informer Site Specific Development for Nested Queries (IPS0004-G)
- I/Informer Site Specific Development Services to Support XML to Clipboard (IPS0004-D)
I/Informer Site Specific Development Services for ACJIS/ NCIC/ MVD/ ACIC/ NLETS (IPS0004-C)
See Approach description, Assumptions, and Constraints above.

I/Informer Site Specific Development Services for inPURSUIT RMS System (IPS0004-E)
See Approach description, Assumptions, and Constraints above.

Additional Informer Transactions (IPS0004-B) – OPTIONED
For additional query transactions for the I/Informer to MVD/AJIS/ACIC/NCIC/NLETS not included in the current State implementation, development services for transactions may be purchased from Intergraph in sets of 5.

Intergraph has included optional pricing for I/Informer Site Specific Development Services for Additional ACJIS Transactions for the following requirements:

- **CAD 14.5.** The system should provide pre-defined agency-configurable query forms to include:
  - 14.5.8. Driver transcript query by name
  - 14.5.9. Driver transcript query by operator's license number
  - 14.5.10. Local Warrant files
  - 14.5.14. All vehicles listed to an individual
  - 14.5.16. All other agency-definable forms as defined by the County

- **CAD 15.1.** System should provide a minimum of the following NLETS transactions:
  - 15.1.1. MKE Description
  - 15.1.2. ACQ/AVQ NLETS Commercial Carrier Query
  - 15.1.3. AVQ NLETS Commercial Vehicle Query
  - 15.1.4. CWQ Interstate Concealed Weapons Permit Query
  - 15.1.5. DQ Interstate Driver's License Query
  - 15.1.6. IPQ/FPQ Interpol Wanted Persons
  - 15.1.7. ITQ/FTQ Interpol Stolen Travel Documents
  - 15.1.8. IVQ/FVQ Interpol Stolen Vehicles

**Notes:**
- In lieu of purchasing additional transactions, Intergraph provides a free form that can be used to query the information.
- In addition, the customer has the ability to develop their own HTML forms. Using these forms and VB scripting tools, the customer can create a query transaction in the exact format the external data source is expecting. I/Informer will then submit (deliver) that query transaction to the external data source and wait for a response. When I/Informer receives that response, it is routed back to the Client workstation/MDC where the query was originally submitted.
- See Assumptions and Constraints above.
I/Informer Site Specific Development Services to Support for DMV images from the State (IPS0004-F)

Intergraph has provided pricing for site-specific development services to support the return of images from the DMV provided the State supports this as part of the transaction.

Assumptions:

- Assume the DMV images are through the same message switch as the state/NCIC transactions and that this interface supports the return of DMV images. If not, this bid will need to be revisited.
- The State supports the return of the image data as part of the message.
- For customer’s running MPS, the application requires that I/Informer server store the images in the database so that MPS can pull the image from the database.
- NOTE: I/Informer responses that contain image data will be returned as XML-tagged responses and will contain a hyperlink that, when clicked, will retrieve the image from the server share and display it. This could affect how responses are currently displayed at this site: If certain responses contain appended text-based data and an image is associated with one of those responses, then multiple responses will be generated.
- Informer will convert the state messages with images in them to XML if the message format is not native HTML or XML already.
- The customer is responsible for providing a complete and accurate description of the on how the image is return.
- The customer needs to have enough disk space on their database server, com server, and workstations to store the images.
- Also we assume they will use the DSEO-2020 (Datamaxx Standard Embedded Object). If DSEO-2020 is not used, then additional services development to create a new remote to support images required.
- The customer’s wireless infrastructure will need to have the bandwidth necessary to support the retrieval and display of the images. If not, they may not be able to retrieve the images.

Constraints:

- See Constraints above

I/Informer Site Specific Development for Nested Queries (IPS0004-G)

Intergraph has provided pricing for site-specific development services to support Nested Queries – i.e. allowing queries to be grouped and run automatically based upon event type.

Assumptions:

- The customer will provide documentation/response formats.
- The customer will define the transactions required in the nested inquiries.
- The responses contain proper field tags/format that enables the nest inquiry parsing.
- The information will be provided 60 days prior to delivery.
- If the State changes a response used in a nested/super query, that query may no longer be supported.

Constraints:

- See Constraints above
I/Informer Site Specific Development Services to Support XML to Clipboard (IPS0004-D)

To query NCIC/CJIS, users of inPURSUIT FBR enter the queries using the I/Informer capabilities within the Mobile for Public Safety (MPS) application. Query results are then made available to the FBR user through a shared repository for import into their FBR form.

The inPURSUIT FBR has an existing interface with MPS that is utilized in the FBR solution. The inPURSUIT FBR and Mobile for Public Safety (MPS) share a common repository from which to pull NCIC returns initiated via the Mobile for Public Safety (MPS) product. From within the FBR form users are provided a Query Form that is used to query the Mobile for Public Safety (MPS) FBR shared data store. Results are returned and the user is provided the option of selecting the correct result that is then utilized to populate the FBR form elements where applicable. Queries currently supported include Master Name, Property, and Vehicle.

Intergraph has bid Site Specific Development Services to parse the responses returned from the State/NCIC for the standard inquiries Person, Article, Gun, and Vehicle for the Field Reporting clipboard.

Assumptions:

- Any additional responses identified by the customer would require additional services
- Intergraph assumes that the important tagged data consists of parsable items from the response that are basically searched in our current implementation such as nam, lic, vin, and dob
- The customer must provide the response format/examples to Intergraph at least six weeks before Field Reporting is scheduled to be delivered. The exact content/format must be provided so that the Informer XSL file(s) and I/CAD database tables are configured properly to support these responses

Constraints:

- See Constraints above

1.4 inPURSUIT LINK

One (1) license of inPURSUIT Link is included. The inPURSUIT Link is a one-way interface between the I/CAD System and the inPURSUIT RMS.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

The inPURSUIT Link interface is used to push data collected during an I/CAD Call for Service to the inPURSUIT RMS.

Approach:

Integration between the I/CAD System and the inPURSUIT RMS application is via the inPURSUIT Link utility and is implemented by transferring defined I/CAD Calls for Service data to the inPURSUIT database using web services to publish the data. This data transfer enables closed incident information collected in the I/CAD environment and mapped to the relevant fields of the inPURSUIT database to pre-populate the incident form in the inPURSUIT application, thereby reducing the need to re-enter data.

Assumptions:

- None

Constraints:

- inPURSUIT Link does not support features for obtaining the next available case number, location verify from within the third-party application, or any other I/CAD-related functionality
- inPURSUIT Link transfers occur automatically at event closure
1.5 MASTER TIME INTERFACE (XNTP)

One (1) license of the Master Time Interface (XNTP) is included. XNTP provides a one-way interface between the SpectraCom NetClock receiver and the proposed servers.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

XNTP is a third-party freeware package developed by the University of Delaware that, when used in conjunction with the SpectraCom NetClock receiver, updates the servers' system clocks permitting time synchronization within the proposed Public Safety environment.

Approach:

As proposed, Intergraph will use the XNTP freeware, publically available from the University of Delaware, to synchronize the server environment to the existing Positron NetClock 9183. Because timestamps are applied as data is written to, or requested from, the server environment, it is not necessary to synchronize individual client hardware. However, if desired, the County may use the native W32Time functionality, internal to the Windows operating environment, and a direct Internet connection to synchronize PSAP client hardware with the Internet clock, if desired.

Assumptions:

- None

Constraints:

- None

1.6 I/PAGE

One (1) license of the I/Page Interface is included. I/Page is a one-way interface between the I/CAD System and a paging controller.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

I/Page interfaces to a third-party paging controller, enabling alphanumeric messages or tonal pages to be transmitted to destination pagers from I/CAD clients. The interface supports the following protocols:

- TAP (Teletactor Alphanumeric Paging Protocol)
- SNPP Level 1 (Simple Network Paging Protocol)
- SMPP (Short Message Peer-to-Peer Protocol)
- SMTP (Simple Mail Transfer Protocol)
- WCTP (Wireless Communications Transfer Protocol)

Approach:

Using one of the protocols identified above, I/Page interfaces to a third-party paging controller to enable alphanumeric messages or tonal alerts to be transmitted to destination pagers from I/CAD clients. Using the I/CAD System Messaging functionality, pages may be addressed to individuals or groups of pagers, and pages are logged by the I/CAD System. I/CAD can also be implemented to send standard dispatch pages to designated logged on pagers in response to a unit dispatch. Message length is limited to the capabilities supported by the pager.

Because most paging systems only support one-way communications, I/Page cannot confirm receipt of a message, but can confirm that the paging controller acknowledged the message, unless the paging system uses TAP protocol. If a message cannot be sent, designated users receive notification indicating the nature of the problem.
The I/Page interface supports the following 3 basic functions:

- Automatically sending dispatch pages to appropriate logged on units. Dispatch related conditions can be placed against these pages to implement conditional paging
- Using the I/CAD Send Messaging functionality to enter paging text or pre-formatted text
- Manually sending dispatch or Event information using the I/CAD Send Message function by entering an event number. Using the manual function, the I/CAD software builds a text message just as it does for the Automatic dispatching function; however, the message can be modified by the dispatcher prior to sending the information

In addition, I/Page may be implemented so that specific event priorities and/or deployment plans associated with alarm levels, Emergency Service Zones, and types are identified with specific pagers within each agency/dispatch group. Using these identifications, if an event’s initial priority is updated during the course of an event, the system will automatically broadcast the page to those pagers identified by that priority within the designated agency/dispatch group. Using these configurable elements, the system may be implemented to automatically notify specified emergency services officers when certain event types are created, for example, a chemical spill; when any event is created at a particular location, for example, an event at a nuclear plant; or when an event reaches a designated alarm level, for example a Level 3 fire.

Assumptions:

- Each distinct paging controller type requires a separate license of I/Page used at each site. However, the County may use multiple paging providers using the same protocol, and these would be considered a single paging controller for licensing purposes. Intergraph’s current bid assumes use of a single paging controller type. If additional controller types are used, Intergraph’s bid must be re-evaluated. Each license of the I/Page interface supports any number of pagers
- Intergraph assumes that one of the protocols listed above will be used, if not the proposed bid is null and void
- Connection to the paging controller is assumed to by via TCP/IP or RS-232

Constraints:

- I/Page does not support bi-directional communications. However, page acknowledgement is supported if the paging controller used supports the SNPP Level 1, SMPP, WCTP, or SMTP protocol. TAP protocol does not support acknowledgement
- The County is responsible for providing any Software Development Kits (SDKs), phone lines, modems, or internet connections necessary to implement the interface to the paging controller
- The customer is responsible for providing complete and accurate documentation for the paging system interface
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input/output formats or data requirements associated with the third-party vendor’s product
1.7 I/PUSH TO TALK

One (1) license of the I/Push to Talk (I/PTT) Interface is included. I/Push to Talk interfaces to a radio system controller, enabling the display of Push-to-Talk (PTT) information on workstations running the I/Dispatcher product.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

I/PTT provides a two-way interface between the radio system and the I/CAD System. The interface supports the following protocols:

<table>
<thead>
<tr>
<th>I/PTT/SMT Interface</th>
<th>Vendor:</th>
<th>Product:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATIA</td>
<td>Motorola</td>
<td>Flexible Air Traffic Information Access (ATIA) Version 3.4 and 3.5, Requires that the radio system vendor's is backward compatible.</td>
</tr>
<tr>
<td>CADI</td>
<td>Motorola</td>
<td>Computer-Aided Dispatch Interface</td>
</tr>
<tr>
<td>CES</td>
<td>CES Wireless Technologies</td>
<td>CES Wireless fleet-CONTROL API</td>
</tr>
<tr>
<td>Cimarron</td>
<td>Cimarron Technologies</td>
<td>Cimarron Standard Classic</td>
</tr>
<tr>
<td>Cimarron 1207</td>
<td>Cimarron Technologies</td>
<td>GE Star</td>
</tr>
<tr>
<td>CTRAM</td>
<td>Motorola</td>
<td>Centracom</td>
</tr>
<tr>
<td>EricssonMACOM</td>
<td>M/A-COM (Ericsson, GE, Tyco)</td>
<td>RIM2RSM Protocol</td>
</tr>
<tr>
<td>Motorola MCC7500</td>
<td>Motorola</td>
<td>MCC7500 Console</td>
</tr>
<tr>
<td>Motorola Centracom</td>
<td>Motorola</td>
<td>Centracom Gold Elite (MCGE) Console</td>
</tr>
<tr>
<td>Sims II</td>
<td>Motorola</td>
<td>SIMS II CADI</td>
</tr>
<tr>
<td>SMARTZONE</td>
<td>Motorola</td>
<td>SmartZone/SmartNet</td>
</tr>
<tr>
<td>SMT80COM</td>
<td>Motorola</td>
<td>SMT-80 GCC-80</td>
</tr>
<tr>
<td>TMRS</td>
<td>M/A-COM (Ericsson, GE, Tyco)</td>
<td>CADLink II and Harris C3 Maestro Gateway</td>
</tr>
<tr>
<td>VrcToronto</td>
<td>Motorola</td>
<td>VRC Radios</td>
</tr>
</tbody>
</table>

Approach:

I/PTT provides an interface to a radio system controller via a TCP/IP network connection or RS-232 serial port, enabling display of PTT information on workstations running the I/Dispatcher product. Within restrictions defined by the existing radio system and the site-specific implementation, PTT information displayed for each radio transmission to the I/CAD environment can include:

- Unit ID and/or radio ID, including handheld radio ID, if applicable
- Talkgroup
- Unit status
- Pre-defined text that has been mapped to a radio user command, such as a status update
- Unit emergency signals
- Information or messages supported by the radio system
PTT data appears in a banner on the I/Dispatcher workstation in the order defined by the customer and may be configured to scroll vertically or horizontally across the terminal screen. Furthermore, the information displayed may include all agencies and dispatch groups or can be filtered to display only specific agency or dispatch group data. Receipt of an Emergency Alarm triggers the I/CAD Unit Emergency command, which automatically notifies all I/Dispatcher and, optionally, all I/Calltaker positions of the emergency by enabling the Unit Emergency button and sounding an audible alert. A Unit Emergency dialog box may also be enabled.

Assumptions:

- I/PTT requires one license per distinct radio system controller
- Intergraph assumes that the I/CAD System will communicate with a single radio controller. The County will be responsible for the communication between the radio controller and both the Motorola P-16 to the Motorola P-25 radio system
- Intergraph assumes that the radio system to I/CAD System connection will be made via RS-232 or via TCP/IP, and that both PSAPs will run the same radio system
- Intergraph assumes that the radio system used by the County is one of the supported systems listed above. If not, this bid will need to be revisited

Constraints:

- Licensing for I/PTT is based on the number of radio system controllers
- Intergraph understands that the County is transitioning from the Motorola P-16 to the Motorola P-25 radio system and is currently communicating to both through a single radio system controller. The County will be responsible for the communication between the radio controller and both the Motorola P-16 to the Motorola P-25 radio system. Therefore, the configuration should only require one license of I/Push to Talk. If that is not the case, an additional license of I/PTT will be required to support both the P16 and P-25 radio system simultaneously
- The County is responsible for providing complete and accurate documentation on the radio system or application interface to which I/PTT interfaces and for any third-party hardware/software/licenses or radio system Software Development Kit (SDK) required by the radio system vendor to implement the interface
- The County will be responsible for providing Intergraph with a radio system vendor contact for the duration of development and testing of this interface
- At a minimum, the PTT packets received from the radio system must include the talk-group / channel being used and the Radio ID
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input/output formats or data requirements associated with the third-party vendor’s product
1.8 I/MOBILE DATA TERMINAL TO INTERGRAPH MOBILE FOR PUBLIC SAFETY

One (1) license of the I/Mobile Data Terminal (I/MDT) interface is included. I/MDT is a two-way interface between the I/CAD System and the mobile I/CAD environment – Intergraph Mobile for Public Safety (MPS).

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

The I/MDT interface supports communications between the dispatch environment and the mobile data terminals running the Mobile for Public Safety application.

Approach:

Used in conjunction with the Mobile for Public Safety (MPS) application, the I/MDT interface supports communications between the mobile user, the I/CAD System, and other mobile data terminals (MDTs). To this end, the combination of I/MDT and MPS application extends the range of the I/CAD System, empowering remote personnel with client access to information maintained in the I/CAD Database and to a subset of I/CAD commands. Furthermore, because I/MDT and MPS are specifically developed to work within the I/CAD environment and are designed to use the data structure of the I/CAD Database, the flow of data between the proposed mobile data communications system and the existing I/CAD System is seamless.

Assumptions:

- Intergraph assumes that the County-provided mobile data terminals meet all hardware/software requirements delineated on the Configuration Diagram provided in Attachment C.

- Intergraph assumes that the County’s radio system is one of the currently supported systems listed below – if not, this bid will need to be revisited:
  - Motorola RD-LAP
  - DataRadio DMP
  - Any Winsock-compliant IPStack provider
    - WNGS/MWCS (Motorola IPStack on top of RD-LAP)
    - MA/COM EDACS (No native support for EDACS API – IP support only)
    - DataRadio IP (IPstack on top of DMP – provided by DataRadio)
    - CDPD
    - GPRS
    - 1xRTT

- Intergraph assumes that all mobile units run the same application level protocol

Constraints:

- This is a software-only bid

- The County is responsible for providing a complete and accurate description of the radio interface protocol, which should be provided by the radio system vendor. Intergraph’s preferred interface model is a driver providing a UDP (TCP/IP) protocol stack in the Mobile Data Device. However, use of an IPStack limits the mobile environment to one network protocol at a time. In order to access multiple wireless communication systems the County will be required to implement a middleware product, such as NetMotion
1.9 I/TRACKER

One (1) license of the I/Tracker interface is included. I/Tracker provides a one-way interface between a third-party AVL system and the I/CAD System.

- Note: The pricing and configuration covers the required licenses necessary to support redundancy of the Interface/Communications Server and to support the Backup environment

The I/Tracker interface accepts incoming vehicle location data received from an Automatic Vehicle Location (AVL) device and/or from I/MDT when global positioning system (GPS) data is sent by an in-vehicle computer. This product enables unit location to be automatically updated on I/CAD System workstation and MPS map displays.

When AVL systems accept commands that control the frequency of location updates from an external system, I/Tracker interfaces with the AVL system to define the frequency of location reporting based on unit type and status and on event type.

Note: If the I/Incident Analyst product is purchased, I/Tracker also allows playback of routes taken by units equipped with AVL hardware.

The Interface supports:

- NMEA
- TAIP
- OpenSky
- Blue Tree
- Sierra Wireless RNAP

Approach:

I/Tracker accepts incoming vehicle location data received from an Automatic Vehicle Location (AVL) device and/or from I/MDT when GPS data is sent by an in-vehicle computer. This product enables unit location information to be updated automatically on workstation and MPS map displays.

When AVL systems accept commands that control the frequency of location updates from an external system, I/Tracker interfaces with the AVL system to define the frequency of location reporting based on unit type and status and on event type. AVL data may be used within the I/CAD System Recommend Unit functionality.

Depending on the existing AVL solution, the I/Tracker interface supports three different modes of operations: passive, dynamic, and poll group.

- In the passive mode, I/Tracker interfaces to the radio data system and receives AVL position reports directly from in-vehicle GPS receivers. Passive mode minimizes processing and provides a reasonable solution for relatively small numbers of vehicles and reduced radio system bandwidth
- In dynamic mode, GPS receivers must be programmable by an external source. This allows I/Tracker to control the reporting behavior of the GPS receiver so that parameters, such as delta distance and delta time, may be varied
- In poll group mode, I/Tracker interfaces to an AVL controller, a software/hardware solution that performs the actual polling of vehicles
Assumptions:

- Intergraph assumes that the County-provided mobile data terminals meet all hardware/software requirements delineated on the Configuration Diagram provided in Attachment C.
- The I/Tracker interface establishes communications between a third-party AVL controller/message switch and the I/CAD System. Intergraph assumes that communications between these systems will be achieved via TCP/IP or RS-232
- Intergraph assumes that all mobile units run the same application level protocol
- The I/Tracker interface supports NMEA 0183, OpenSky, BlueTree, Sierra Wireless RNAP, and TAIP protocols and devices that support these protocols should be compatible with I/Tracker. If the County is currently running AVL hardware that I/Tracker does not support, additional services must be purchased to develop a custom AVL interface
- The customer is responsible for providing complete and accurate documentation on any customer-provided GPS hardware and on the radio system

Constraints:

- This is a software-only interface. GPS hardware and associated installation services for each vehicle, as well as a referential GPS base station for differential correction if desired, are assumed to be provided by the County. The infrastructure necessary to support the AVL bandwidth requirement must also be provided by the County
- Use of an IPStack limits the mobile environment to one network protocol at a time. To access multiple wireless communication systems requires that the County implement a middleware product, such as NetMotion
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input/output formats or data requirements associated with the third-party vendor’s product
- Please note that each distinct implementation of the I/Tracker interface to a different AVL controller, radio system, or direct AVL solution that does not require an AVL controller requires a separate copy and implementation of the I/Tracker product
2. **INPURSUIT RMS INTERFACES**

2.1 **ARIZONA CRIMINAL JUSTICE INFORMATION SYSTEM (ACJIS)**

Intergraph will provide a support for bi-directional query and response services from ACJIS to INPURSUIT RMS leveraging the integration between INPURSUIT RMS and I/Informer. The Field Reporting (FBR) to ACJIS interface will be provided via an existing interface with MPS. The ability to update the RMS from NCIC/CJIS query return data will only be provided via the import of FBR forms containing NCIC/CJIS result data acquired from the Mobile CAD application.

**Approach:**

**FBR:** To query NCIC/CJIS, users of INPURSUIT FBR enter the queries using the I/Informer capabilities within the MPS application. Query results are then made available to the FBR user through a shared repository for import into their FBR form.

The INPURSUIT FBR has an existing interface with MPS that is utilized in the FBR solution. The INPURSUIT FBR and MPS share a common repository from which to pull NCIC returns initiated via the MPS product. From within the FBR form users are provided a Query Form that is used to query the Mobile for Public Safety (MPS) FBR shared data store. Results are returned and the user is provided the option of selecting the correct result that is then utilized to populate the FBR form elements where applicable. Queries currently supported include Master Name, Property, and Vehicle.

**RMS:** The ability to update the RMS from NCIC/CJIS query return data will only be provided via the import of FBR forms containing NCIC/CJIS result data acquired from the Mobile CAD application.

The INPURSUIT RMS to ACJIS Interface will be provided by leveraging the integration between the RMS and I/Informer Message Switch.

The Police RMS/JMS will pass the site ORI and a message-type, and transaction-id in the header. The message body will contain the data elements from the Police RMS modules of Stolen Property and Master Names, to support queries of:

1. The search modules that will support these queries in the RMS/JMS are as follows:
   - The Master Name Search will support the Drivers License Query and the Person related queries
   - The Master Vehicle Search will support the Vehicle Query

2. The Ability to Query ACJIS for the following records from the MasterName module of the RMS: warrant; restraining order; order of protection; sex offender; property; vehicle; person of caution; gang and gang member; gun; and missing persons (adult and juvenile) information (assume transaction type is the only attribute that changes between transactions, message data is the same for each transaction.) If a user has the correct privileges on an authenticated RMS client, the ability to submit to CJIS will be provided via a button on the MasterName Module.

3. The Evidence, Property and Pawn search modules will provide the Article query and the Gun Query. If a user has the correct privileges on an authenticated RMS client, the ability to submit to CJIS will be provided via a button on the Evidence Module.

4. The ability to query CJIS/NCIC warrant, restraining order, and order of protection will be provided from the Court Document Module of the RMS. If a user has the correct privileges on an authenticated RMS client, the ability to submit to CJIS will be provided via a button on the Court Document Module. The ability to Query CJIS for warrant, restraining order, and order of protection will be provided via a button on the Search Court Document Module.

The data elements required for ACJIS Data Entry are assumed to match those data elements required for ACJIS Inquiries; however, the credentials required for ACJIS Entries and Data Clearing may exceed those users credentials needed for inquiries. It is assumed that the I/Informer switch will reject any ORI without the required access privileges.
Assumptions:

- Query results will be viewable in a dynamic tab in the RMS for each module filtered by the user who initiated the query
- FBR will leverage Mobile CAD for ACJIS Integration
- There is no data parsing of the query results included in this estimate
- Credentials and security will be managed by I/Informer
- The costing provided for this interface is based upon these specifications; however, we would be happy to provide changes or enhancements based on additional negotiations, as required
- Following transactions will be supported under this interface (RMS and FBR):
  - ACQV -- Query Stolen Vehicles. 27
  - RQ – Vehicle Registration Query. 30
  - ACQB – Query Stolen Boat. 34
  - BQ – Query Boat Registration. 36
  - ACQW – Query Wanted Person. 43
  - DQ – Query Driver Status. 55
  - ACQA – Query Single Article. 62
  - ACQG – Query Gun. 73

OPTIONAL SERVICES: Additional Arizona Criminal Justice Information System (ACJIS) Masks

The State of Arizona ACJIS has over 250 screens for entry, queries, and modifications. Intergraph has included optional services to develop additional ACJIS masks. Of the 250+ transactions, the following will be added as an option:

- ACEV – Enter Stolen Vehicle. 24
- ACEB – Enter Stolen Boat. 31
- ACEW - Enter Wanted Person. 39
- ACEM – Enter Missing Person. 46
- ACQM -- Query Missing Person. 49
- ACEA – Enter Single Article. 60
- ACEG – Enter Gun. 71

Assumptions:

- Please refer to assumptions above to ACJIS interface

Constraints:

- No modified locate/clear/or cancelled transactions are proposed
2.2 Arizona Automated Disposition Reporting System (ADRS)

Intergraph will provide a two-way (import / export) process from inPursuit RMS leveraging MQSeries.

Arizona Automated Disposition Reporting System (ADRS) RFP Requirement: An interface, tying together the system’s RMS, the Sagem Morpho Automated Fingerprint Identification System (AFIS) Livescan, ImageWare Mug Photo Interface systems and Maricopa County Sheriff Pre-booking Portal. The initial version of ADRS provides a web interface to justice agencies for entering disposition and sentence data. ADRS interfaces with the Arizona Automated Fingerprint Identification System (AZAFIS) and the Arizona Computerized Criminal History system (ACCH). AZAFIS populates all of the fingerprint-based arrests in the State into ADRS and ADRS has a 2-way interface with ACCH. Dispositions added, updated or deleted through ADRS are updated into ACCH on a real-time basis. If updates occur directly into ACCH related to Arrest / Charge information, transactions are then sent to ADRS to keep the two systems synchronized.

Approach:

Export: The inPursuit application will provide an output of Arrest data to the ADRS application upon receiving a PCN number from the AFIS import described below. The interface will provide a data export in standard inPursuit XML Data file format via MQ Series. The XML data provided to ADRS will contain a maximum of 100 data elements to the ADRS system.

Import: An RMS Import will be provided to import and update Arrest records from the ADRS. It is assumed that this data will be sent in an XML file format and will not exceed 50 data elements.

Assumptions:

- Intergraph will provide an XML Data file output from FBR to ADRS and will not exceed 100 data elements
- The inPursuit RMS will accept an update transaction of Arrest records from the ADRS in XML not to exceed 50 data elements

Constraints:

- Records that do not exist within the ADRS Update transaction will be ignored
- Duplicates transactions for the same record from the ADRS Update will change the RMS record to the latest XML Data processed
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input / output formats or data requirements associated with the third-party vendor’s product
- No data mapping for Charges or Mastercodes is included in this interface
- All charge codes sent by ADRS are assumed to be the same as the charge codes in the RMS
- All Master codes sent by ADRS are assumed to be the same as the Master codes in the RMS
- The Arrest Number will be the shared identifier used to link the two systems
- All transactions will be complete and will serve to overwrite the data in the RMS
- No partial updates of data will be supported by this interface
- Complete transactions are defined as a complete set of data equal to the set of data being updated with no intermediary transactions required to complete the transaction
2.3 Maricopa County Pre-Booking Portal

Intergraph will provide a two-way (import / export) process from inPursuit RMS to the Maricopa County Pre-Booking Portal system leveraging MQ Series.

Maricopa County Pre-Booking Portal RFP Requirement: The Sheriff's Office books prisoners into the Maricopa County Jail. Officers need to be able to submit pre-booking information from the RMS to the Maricopa Jail Management System. The Sheriff's Office would like to eliminate duplicate data entry and maintain an arrest record for the booked prisoners in its RMS.

Approach:

Data is entered via the arrest forms provided in inPursuit’s FBR. This data then goes through an approval process, which could include an approval step by a booking officer. Once the arrest record has reached a status of “complete,” this interface will provide an output of arrest data collected in FBR to the Maricopa County Pre-Booking Portal system application. The interface will provide a data export in XML Data file format similar to the GJXDM format that is used in the current RMS to Pre-Booking interface with a note that only data that is collected via the FBR forms and either available in the COTS application or specifically added as a configuration modification identified elsewhere in the contract will be mapped for the arrest capture transaction. This arrest XML will then be placed on a queue within the Maricopa domain.

The RMS will receive (via a file placed into an RMS identified queue) a return message with the prisoner’s PCN, SID, and FBI numbers along with key identifiers from the original message. This data will be used to update the appropriate records in the RMS database.

Upon acceptance of the prisoner in the County Jail, a second message will be received via the RMS queue with the key identifiers from the original message and the CCN along with any changes to the original charge information. This information will be used to update the appropriate records. Additionally, this message will have two PDF attachments (Form IV Form and the Arrest report) that will be attached to the arrest record in RMS.

The following describes the two-way information flow between the RMS to the MCSO Pre-Booking System.

- An Arresting Agency’s personnel enter arrest information into the Agency’s RMS via the forms provided in FBR. Once the status has been set to complete the pre-booking, information will be sent to the MCSO pre-booking system in an Arrest XML message via a file placed onto the pre-booking queue. Note: The setting of this status will be a manual process.

- Errors will either be identified via a workflow process prior to setting the form to complete or they will be corrected manually within pre-booking.

- After the arrest has been processed through Pre-Booking, the prisoner’s PCN, SID and FBI numbers will be received into the Pre-Booking Application automatically from AFIS. These key identifiers are then returned to the original Sending Agency in reply XML messages, along with key data from the original Arrest XML message, as they are received from AFIS. These XML messages will be sent to the RMS by placing an xml file onto the RMS queue.

- Upon acceptance of the prisoner into the County Jail by MCSO personnel, the Pre-Booking application generates yet another Arrest Reply XML message. This message includes the Common Case Number (CCN), the MCSO Booking Number, and the PCN. If any changes are made in Pre-Booking to the original charge data, that information will also be returned. Additionally, the Form IV Form PDF (and XML message), and the Arrest Report PDF will be delivered to the Arresting Agency’s RMS by delivering the data to the RMS queue.
Assumptions:

- Intergraph will utilize MQ Series functionality to send and receive data from the pre-booking interface
- Pre-booking transactions for this interface will be limited to the following 3 transactions:
  - One RMS to Pre-booking system transaction is the initial booking data transfer to the Pre-booking system when
    the Arrest status is manually set to complete
  - One Pre-booking to RMS transaction is the transmission of AFIS data to the RMS (this could be sent multiple
    times and will over-write any previous information each time it is received)
  - One Pre-booking to RMS transaction is the transmission of Case Number and Charge updates to the RMS
- Unless specifically noted, each data transmission will be once per arrest
- All messages sent to the Pre-booking system will be complete messages
- All messages sent to the RMS will be complete messages
- No updates for individual transactions will be supported in this interface
- No code mapping is included in this interface estimate
- Master codes used by the Booking system and RMS to exchange data will be the same in each system
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input /
  output formats or data requirements associated with the third-party vendor’s product
- Assumes 2 weeks of integration testing. Any additional testing will require additional costs to be incurred

2.4 **LiveScan Interface**

Intergraph will provide a one-way export process from inPursuit RMS leveraging Web-Services.

**LiveScan RFP Requirement:** When the MCSO Arrest/Booking number is entered, the LiveScan system will pull arrest/subject
information from the RMS arrest module eliminating the need for duplicate data entry.

**Approach:**

The inPursuit RMS application will provide an output of arrest data entered via the forms provided in FBR to the Livescan
application. The RMS interface will provide a data export in standard inPursuit Initial Arrest XML Data file format via a Web
Service that can be executed manually or at a specified Arrest Status. The Web Service will provide a maximum of 50 data
elements to the LiveScan system.

**Assumptions:**

- Intergraph will provide an inPursuit Standard InitialArrest XML Data file output via a Web-Service and will not
  exceed 50 data elements
- Livescan system will be responsible for importing the standard InitialArrest XML Data file
- No code mapping is included in the estimate for this interface
- All codes shared between the Livescan system and the RMS will be the same
- Livescan system can consume XML
- Livescan system can provide a web-service to consume XML if XML is auto-generated at the time an Arrest status is
  selected, or Livescan system can pull XML from a shared repository
- The Arrest / Booking number is the shared identifier between systems
- Initial Arrest XML is sufficient to support this interface

**Constraints:**

- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input /
  output formats or data requirements associated with the third-party vendor’s product
2.5 COPLINK INTERFACE

Intergraph will provide a one-way (export) process from inPursuit RMS.

**COPLINK RFP Requirements:** An export, pushing incident report information from the RMS system to the Sheriff’s Office’s COPLINK system. COPLINK’s vendor (i2) has a contract established with AZLink agencies, of which MCSO is a member, to implement this interface.

**Approach:**

Intergraph will provide an XML-based export of incidents and related data to COPLINK. This interface is being quoted and developed to become a “standard COTS” interface rather than a custom interface for Maricopa. As such, the format and data transport method will be determined between Intergraph and COPLINK and may not utilize Maricopa’s preferred data transport method.

**Assumptions:**

- Intergraph will develop a standard COTS interface for exporting data from inPursuit to COPLINK.
- If the “standard COTS” interface will not meet Maricopa’s needs then this can be re-quoted as a custom interface using MQ Series

**Constraints:**

- The City is responsible for costs incurred by the third-party vendor for integration of data
- Intergraph will work with COPLINK to map data from the inPursuit application to an XML standard format

2.6 MARICOPA COUNTY ATTORNEY INTERFACE

Intergraph will provide a one-way export process from inPursuit RMS via MQ Series.

**Maricopa County Attorney RFP Requirement:** When a case is ready to submit for prosecution, the case agent needs to initiate a process that will send the CASE Report (DR) and all textual-based supplements to the case report to the Maricopa County Attorney’s Case Management System. The data transferred will be in XML format. Prosecutors will require the capability to further the Case Report back to the submitting agent with instructions on what additional data needs to be provided. This transfer back and forth will continue until the case is suitable for prosecution, or a determination not to prosecute is reached. When the County Attorney’s Office has completed work on a case to the point that associated evidence in the property room can be released, their system will send a status message to the assigned case agent and the MCSO Property Room. Once such a notice is received, the RMS should continue to remind the case agent every 30 days or until the case agent sends a property release notification to the Property Room. The County Attorney’s Office will need a TBD number of limited function RMS seat licenses to view/hear all other records (photos, recordings, attachments etc.) that are associated with cases that have been submitted for possible prosecution. They will also require the capability to download any of these records to their system. Members of the County Attorney’s IS Staff will perform the necessary programming of their system and assist the RMS vendor with testing and acceptance.

**Approach:**

The Intergraph RMS will provide an inPursuit Standard XML File Format data export via MQ Series for the Maricopa County Attorney’s Application (CASE). The Data export will be limited to a maximum of 100 data elements. Executing a button on the Case Management Record will provide an output of this data via the Web-Service.

The RMS application will be installed on a limited number of workstations in the County Attorney’s office. Should additional information be required on a case, this would be initiated via a workflow in the RMS application from these workstations and would not be part of the interface.

**Assumptions:**

- Intergraph will provide an inPursuit Standard XML Data file output to be placed on the County Attorney’s MQS Queue, that does not exceed 100 data elements. Each export transaction would include the entire record and replace the existing data previously transferred
Constraints:

- This interface will be a one-way export of data only; not a two-way interface
- Intergraph will provide a limited number of technical support hours (no more than eight) for database layout and relationship questions only

2.7 JUSTICE WEB INTERFACE (JWI)

Intergraph will provide a one-way import process from an AZDPS generated flat file of warrant data to the inPursuit RMS.

Justice Web Interface (JWI): JWI is a software product created by a local vendor (Pragmatica L.L.C.). Pragmatica has been working on the County’s ICJIS project and has considerable experience in building interfaces with various County, State and National Systems. Currently, County Warrants are being entered into JWI by the County. JWI geocodes the warrant service addresses for its own map display and passes the Warrants on to the State’s ACJIS for posting. Quash transactions are handled in the same manner. The new CAD/RMS will need to receive the geocoded Warrant and Warrant Quash transactions in order to maintain Warrant Service Information in one of its own map layers. Pragmatica has agreed to format the transactions accordingly. JWI is also used by the Sheriff’s Office to query ACJIS and retrieve County Mug-shots and MVD Driver’s License photos. This functionality will become redundant with a new CAD/Mobile system, but the vendors may find that it is less complicated to interface with JWI for the photos.

Approach:

Based on discussion between Intergraph and the County, the warrant import portion of the JWI interface has been changed to be a warrant import from AZDPS. For warrants, an inPursuit interface will be created to import the flat file warrant data provided via ftp by AZDPS. This data will be used to create/update Maricopa County warrant records within inPursuit.

Note: Other functionality related to queries for information will be accommodated by the I/Informer Interface to external systems such as ACJIS/ACIC/NCIC (See Section 1.3 – I/Informer Interface of this document).

Note: Support for Map Display of Warrant Locations - Due to the size of the mobile map data and wireless bandwidth limitations, a daily update to the MPS map is not feasible and not included in this interface.

Intergraph can create for each warrant record with a CAD verified address, a record in the CAD application allowing that data to be displayed on the I/Dispatcher map. However, this functionality has not been included or priced, pending further discussion with the County.

Assumptions:

- The inPursuit RMS will accept a daily flat file of warrant records from AZDPS that will not exceed 50 data elements per record

Constraints:

- Duplicate transactions for the same record from AZDPS will change the RMS record to the latest data processed
- Intergraph cannot be held accountable for incompatibilities that occur in this interface as the result of changes to input / output formats or data requirements associated with the third-party vendor’s product
- Assumes two weeks of integration testing. Any additional testing will require additional costs to be incurred
2.8 Maricopa County Pawn Interface

Intergraph assumes that the County will transition from their current Pawn System to the inPursuit Pawn Module. Intergraph will provide a one-way import process from the area Pawn Shops within the County to the inPursuit RMS leveraging Web-Services.

Maricopa County Pawn: A timed, one-way push interface between the RMS and Maricopa County’s Pawn System for the exchange of pawned and stolen property information. This may not be required if the vendor proposes a replacement Pawn system that is integrated with their RMS.

Approach:
The inPursuit RMS will support the import of Pawn Records. The Pawn Import Interface is a stored procedure that is designed to recognize eight different formatted file types. These will be the only formats supported.

Assumptions:
- Intergraph will only support the eight Pawn Shop file formats
- Additional file formats may be supported, but will require additional costing

Constraints:
- The County is responsible for costs incurred by any third-party vendor for integration of data
- Intergraph will provide a limited number of technical support hours (no more than eight) for database layout and relationship questions only for data file formats
- NCIC Queries only will be supported as a single, manually initiated transaction for a single Pawn Item from within the inPursuit RMS Pawn Shop Module
- Bulk NCIC inquiries will not be supported
# SOW Attachment E: Training Curriculum

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1 TRAINING OVERVIEW

Each Intergraph project includes the training necessary to ensure that personnel operating the Intergraph software and systems have a full understanding and working knowledge of the installed systems. Training also ensures the success of daily operations within the Communications Center and throughout the Department. Both informal and formal training courses are provided to the appropriate personnel. Course durations are listed in days, assuming an 8-hour day.

1.1 System Preparation Training

Before the initial hardware installation when training typically begins, Intergraph personnel will begin the education and configuration process by conducting introductory workshops. These workshops are structured to begin the data and information gathering process with the intent of expediting system installation. Using an apprenticeship approach, Intergraph introduces the County System Administrator(s) and other key personnel to system data requirements, data management, configuration tools, and the steps necessary to organize and gather the data needed for the I/CAD System. This data is then used to setup and maintain all applications.

Once the commercial, off-the-shelf (COTS) RMS software has been installed, Intergraph will conduct a RMS Configuration Training session. The purpose of the RMS Configuration Training is to instruct the RMS Administrators on how to use the built-in customization/configuration tools of the RMS. This enables them to get an early start on configuring the system. This will give the RMS Administrators the opportunity to establish user accounts, define security permission groups, populate code tables, and customize the RMS prior to the user training. An additional System Administrator Training course is conducted later in the project lifecycle.

1.2 Operations Training

Operations training includes courses designed to teach the proper use of a particular application. Two options are available for this training—the proposed Train-the-Trainer approach or the Train-the-User approach. These training programs are conducted at a mutually agreed upon location and facility. If the hardware has been installed on-site, and the necessary County data prepared, the usual approach is to teach these courses on-site. For the County, Intergraph has proposed the Train-the-Trainer approach for user coursework. All other administrative training will be taught using a Train-the-User approach.

Class size should not exceed the number of students designated for each class with each student allocated one workstation for the duration of the class.
**Train-the-Trainer**

The Train-the-Trainer approach is the most logical training solution for large public safety projects. This method seeks to train the most computer-literate and supervisor-level employees who learn all functions of each Intergraph application, as well as new techniques for the best way to teach user-level employees.

Having completed the Train-the-Trainer program and having a full understanding of the system, the County’s trainers will be prepared to provide their own agency-specific training, which may include some policy or procedural changes in addition to application functionality. Due to the vast functionality of the system, there may be some commands or functions of the application that may not be of benefit to the County’s operation. The Train-the-Trainer approach permits the Core Team, System Administrator(s), and Trainers to learn the full capabilities of the systems while determining which commands and/or functions within the system will be used as part of their operation.

A soft copy of Intergraph user documentation will be provided to County trainers that can be modified and customized to meet site-specific training needs.

**Train-the-User**

To ensure full understanding of the system as a whole, customers may elect to have all users go through full end-user training (Train-the-User) provided by Intergraph training personnel.

The I/CAD Train-the-User program performed by Intergraph instructors includes I/CAD Core Essentials classes (Calltaking, Dispatching, Supervisor) that cover all commands and functions for essential operations in I/CAD. This 5-day program is designed to provide instruction in the basic and essential functions that every operator should know before cutting over to live operations with the Intergraph CAD System. Focus is given to those commands and workflows that are used most frequently in the Communications Center.

**1.3 System Administration Training**

Several System Administrator-level courses are offered to provide the necessary training to persons responsible for system configuration and maintenance. Operating system-level courses are provided to ensure the low-level knowledge needed to support and maintain the system configuration. There are also courses designed to teach the use of available configuration tools and techniques, as well as a site-specific administration session designed around the County’s configuration.

Class size for these highly technical sessions usually does not exceed six persons. It is preferred that each student be allocated one workstation for the duration of the class; however, the maximum number of trainees per workstation should not exceed two.
## 2 Training Courses

### 2.1 List of Training Course

The training courses for the County are as follows:

<table>
<thead>
<tr>
<th>Workshop Description</th>
<th>Workshop Qty</th>
<th>Workshop Duration (days)</th>
<th>Max # Students per Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/CAD Essentials for Trainers (IPST2011)</td>
<td>2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>I/NetViewer for Trainers (IPST2404)</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Mobile for Public Safety (MPS) Configuration Workshop</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Mobile for Public Safety (MPS) for Trainers (IPST2503)</td>
<td>2</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>I/CAD System Administration &amp; Maintenance Essentials (IPST9003)</td>
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<td>4</td>
<td>6</td>
</tr>
<tr>
<td>I/CAD Configuration Essentials (IPST9004)</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>I/CAD Database Schema and Reports Overview (IPST2009)</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>I/Incident Analyst Configuration and Administration (IPST6001)</td>
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<td>4</td>
<td>6</td>
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<tr>
<td>Business Intelligence Administration for CAD or RMS Training (IPST6004)</td>
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<td>Business Intelligence for CAD or RMS User Training (IPST6005)</td>
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<td>6</td>
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<tr>
<td>Business Intelligence for CAD or RMS Pre-Implementation Workshop (IPST6006)</td>
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<td>Business Intelligence for CAD or RMS Post-Implementation Workshop (IPST6007)</td>
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<td>5</td>
<td>6</td>
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<tr>
<td>Map Basics for I/CAD Systems (IPST8001)</td>
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<tr>
<td>Map Maintenance for I/CAD Systems (IPST8003)</td>
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<td>Map Roll Consulting for I/CAD Systems (IPST8004)</td>
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<td>6</td>
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<tr>
<td>Map Workflow Reassessment</td>
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<td>Workshop Description</td>
<td>Workshop Qty</td>
<td>Workshop Duration (days)</td>
<td>Max # Students per Session</td>
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</tr>
<tr>
<td>Mobile for Public Safety (MPS) Reassessment (IPST2007)</td>
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<tr>
<td>I/CAD Reassessment (IPST2006)</td>
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<tr>
<td>RMS/FBR Configuration Training</td>
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<tr>
<td>RMS/FBR System Administrator Training</td>
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<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Web Based Report Server/Ad Hoc Report Builder Train-the-Trainer</td>
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<td>2</td>
<td>10</td>
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<tr>
<td>RMS Train-the-Trainer</td>
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<td>8</td>
<td>10</td>
</tr>
<tr>
<td>FBR Train-the-Trainer</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Crime Analysis Train-the-Trainer</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
## 2.2 Detailed Training Curriculum

### I/CAD Essentials for Trainers (IPST2011)

The I/CAD Essentials for Trainers course is presented to personnel responsible for training public safety call taking and dispatching. This course includes all topics from I/CAD Essentials for Users with an emphasis placed on gaining expertise, perfecting knowledge, and acquiring confidence with the material. Upon completion of this course, attendees will be prepared to train users in I/CAD Essentials.

#### Major Topics

- Call Creation and Update
- Map View Control
- Event and Personnel Inquiries
- Sending Messages
- Recommending and Dispatching Units
- Updating Unit Statuses
- Modifying Unit Properties
- Updating Unit Related Event Information
- Querying Unit and Event Data
- Performing Law Enforcement Specific Operations – Traffic Stop, Subject Stop
- Supervisor Specific Commands
- Interfaces for Users (I/Informer, I/Page, I/FST, and I/MDT for example)
- Advanced I/CAD Functions
- Trainer Guidelines and Techniques for I/CAD

#### Prerequisites

- Knowledge of basic public safety terminology
- Responsibility for training call taking and/or dispatching personnel
- An Introduction to Windows course or equivalent knowledge and familiarity with the Windows user interface

#### Method

- Conducted on-site by Intergraph Personnel

#### Task Classifications

- I/CAD Training Personnel

#### Project Phase

- Should be complete with adequate time to prepare for cutover

#### Duration

- 4 days

#### Student Capacity

- 12, with a maximum of one student per workstation
**I/NetViewer for Trainers (IPST2404)**

I/NetViewer training is presented to personnel responsible for training users who access I/CAD information remotely. This course familiarizes training personnel with the commands used in the I/NetViewer application during event entry and inquiry operations. Laboratory exercises are included with each module to provide additional experience in workstation operation.

<table>
<thead>
<tr>
<th>Major Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event Entry Operations</td>
</tr>
<tr>
<td>Inquiry Commands</td>
</tr>
<tr>
<td>Unit or Crew Operations</td>
</tr>
<tr>
<td>Setting User Preferences</td>
</tr>
<tr>
<td>Other Utilities</td>
</tr>
<tr>
<td>Trainer Guidelines and Techniques</td>
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</table>

<table>
<thead>
<tr>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of appropriate public safety terminology</td>
</tr>
<tr>
<td>Knowledge and familiarity with Windows user interface</td>
</tr>
<tr>
<td>Knowledge and familiarity with latest version of Internet Explorer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted on-site by Intergraph Personnel</td>
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<table>
<thead>
<tr>
<th>Task Classifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training Personnel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should be complete with adequate time to prepare for cutover</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12, with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>
### Mobile for Public Safety (MPS) Workflow and Configuration Workshop (IPST2502)

During MPS implementation, accomplishing certain parts of a customer's workflow with MPS may not be immediately evident to the customers themselves. This session dedicates Intergraph consultants to helping the customer define their workflows using MPS. Before and during this process, specific configuration needs will become apparent, including graphical user interface adjustments, report formats, and other special configuration tasks that may be required to accomplish the customer’s operational requirements. These configuration tasks will be designed and possibly completed during this session. Upon completion, the intent is for the customer to proceed with their MPS user training with the configuration and workflow definition as close as possible to the final, to ensure their users are comfortable and competent with the system.

It will be necessary during this session to have at least one Dispatcher who is familiar with I/CAD and its use present to perform dispatching and other I/CAD tasks as necessary.

#### Major Topics
- Overview of MPS Features and Functions
- MPS Workflow Definition
- Graphical User Interface Design and Configuration
- Report Format Design and Configuration
- MPS Administrative Functions
- Other Configuration Settings as Needed

#### Prerequisites
- Responsibility for mobile computing operations
- Completion of I/CAD Essentials (for Trainers) training
- Identification and documentation of all MPS workflows requiring special attention

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site or at an Intergraph Certified Training Facility by Intergraph Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>System Administrator, Senior Field User and/or Supervisor, Field Training, and Management Personnel</td>
</tr>
<tr>
<td>Project Phase</td>
<td>During initial project implementation, best after I/CAD Essentials for Trainers is complete, but with adequate time to accomplish all necessary configuration changes before MPS user training commences. If done during an upgrade implementation, early in the upgrade process before the Delta training is best, so that any identified configuration changes may be incorporated into the upgrade.</td>
</tr>
<tr>
<td>Duration</td>
<td>3 days, plus additional day will be used by Implementation Engineer to perform configuration tasks</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>Based on the customer's requirements, and available hardware</td>
</tr>
</tbody>
</table>
**Mobile for Public Safety (MPS) for Trainers (IPST2503)**

Mobile for Public Safety (MPS) training is designed to train field trainers in the use and training of the MPS product.

*(Note: MPS Administration is included during the System Administrator training. This session is designed for field trainers.)*

**Major Topics**

- Use of MPS on MDCs, or laptops
- Unit Status Changes
- Inquiries
- Sending and Receiving Messages
- Updating Unit Properties
- Updating Events
- Trainer Guidelines and Techniques for MPS

**Prerequisites**

- Responsibility for mobile computing training
- Assignment of at least one person who has been through I/CAD Essentials training, to perform necessary dispatching and other I/CAD functions
- Availability of customer specific Mobile configuration
- Availability of test or training Mobile PCs for use in class

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>Field User Trainers</td>
</tr>
<tr>
<td>Project Phase</td>
<td>After I/CAD Essentials training is complete, and before cutover</td>
</tr>
<tr>
<td>Duration</td>
<td>2 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>12, with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>
**I/CAD System Administration & Maintenance Essentials (IPST9003)**

The I/CAD System Administration & Maintenance Essentials course provides an overview of administration and maintenance tasks to individuals responsible for the technical administration, management, and/or support of the I/CAD System. Students receive both classroom training and hands-on experience enabling them to perform the basic functions associated with the day-to-day operation and support of an I/CAD System. Please note the stated prerequisites and student capacity, as strict adherence is essential to the successful completion of this course.

### Major Topics

- I/CAD System Overview
- Configuration Maintenance and the Registry
- Basic Configuration of Parameters and Command Line
- Database Client and Application Components
- Listener Overview
- Redundancy and Recovery
- Clock Synchronization
- Regular Maintenance Tasks
- Troubleshooting
- Logging/Support Process
- Customer Care Center Procedures
- Documentation/Change Log and Other Maintenance Log Generation

### Prerequisites

- Strong adherence to the following prerequisites is absolutely mandatory:
  - Responsibility for the administration, support, and maintenance of the I/CAD System.
  - Sound knowledge of the Communications Center Calltaker/Dispatcher process.
  - Working knowledge of Windows. This includes major networking components, including clients, servers, local area networks, network adapter cards, drivers, protocols, and network operating systems. Also requires comfort in the ability to use Windows Explorer to locate, create, and manipulate folders and files, create shortcuts, map network drives, and configure the desktop environment.

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>System Administrator and Other Support personnel</td>
</tr>
<tr>
<td>Project Phase</td>
<td>After the I/CAD Data Workshop, with adequate time before I/CAD Essentials training commences</td>
</tr>
<tr>
<td>Duration</td>
<td>4 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>6</td>
</tr>
</tbody>
</table>
I/CAD Configuration Essentials (IPST9004)

The I/CAD System Configuration Essentials is a follow on course to the I/CAD System Maintenance and Administration Essentials, and provides an overview of the configuration of I/CAD to individuals responsible for the technical administration, management, and/or support of the I/CAD System. This course may also be used as a refresher or review for students of the I/CAD System Administration course, to review the configuration of I/CAD. Students receive both classroom training and hands-on experience enabling them to perform the basic functions associated with day-to-day operation and support of an I/CAD System. Please note the stated prerequisites and student capacity, as strict adherence is essential to the successful completion of this course.

Major Topics

- Configuration Maintenance and the Registry
- I/CAD Parameters
- Command Line Configuration
- Configuring Monitors and Map Views
- Using Macros
- Print Template Configuration
- I/NetViewer Configuration
- Documentation/Change Log and Other Maintenance Log Generation

Prerequisites

- Strong adherence to the following prerequisites is absolutely mandatory:
  - Responsibility for the administration, support, and maintenance of the I/CAD System.
  - Sound knowledge of the Communications Center Calltaker/Dispatcher process and the I/Dispatcher application.
  - Working knowledge of Windows. This includes major networking components, including clients, servers, local area networks, network adapter cards, drivers, protocols, and network operating systems. Also requires comfort in the ability to use Windows Explorer to locate, create, and manipulate folders and files, create shortcuts, map network drives, and configure the desktop environment.
- I/CAD System Administration and Maintenance Essentials <or> I/CAD System Administration

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>System Administrator and Other Support Personnel</td>
</tr>
<tr>
<td>Project Phase</td>
<td>After I/CAD System Administration and Maintenance essentials, and experience in administering the I/CAD system has been gained</td>
</tr>
<tr>
<td>Duration</td>
<td>4 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>6</td>
</tr>
</tbody>
</table>
### I/CAD Database Schema and Reports Overview (IPST2009)

I/CAD Database Schema and Reports Overview is presented to personnel responsible for collecting I/CAD statistics including call center, event, and unit history information. This intensive course familiarizes customer-selected staff with features of the I/CAD schema and the skills required to create custom reports for data collection.

#### Major Topics
- Understanding the I/CAD Database Schema
- Creating Reports using Microsoft Access and/or SQL Plus
- Queries and Reports

#### Prerequisites
- Responsibility for I/CAD System administration and/or training
- Familiarity with I/CAD and associated functions
- Knowledge of Microsoft Access and/or SQL

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>System Administrator and Data Analysts</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Should be complete with adequate time to create and customize needed reports for live operations</td>
</tr>
<tr>
<td>Duration</td>
<td>3 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>6, with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>
**Incident Analyst Configuration and Administration (IPST6001)**

Incident Analyst Configuration and Administration is presented to personnel responsible for the administration and support of the Incident Analyst application. This course familiarizes administrative personnel with the installation, maintenance, support, and customization of the Incident Analyst product, and with the maintenance of the various data used by the system. An overview of report/map creation and output options is provided to allow administrative personnel to test the application in preparation for end-user training.

### Major Topics
- Installation and Setup of Incident Analyst
- Establishing Data Source Connections
- Customization/Extensibility to Meet Customer’s Reporting/Mapping Needs
- Creating Map, Chart, Spreadsheet and Report Output
- Setting up a Client Workstation

### Prerequisites
- Familiarization with the CAD database model and data
- Training in, or equivalent knowledge of, I/CAD or I/CAD System Administrator
- Familiar with XML and SQL
- Familiar with GeoMedia Pro

### Method
Conducted on-site by Intergraph Personnel

### Task Classifications
System Administrator, Database Support, or other personnel responsible for reporting and analysis requirements definition and management

### Project Phase
When sufficient I/CAD data is available for obtaining good sample reports

### Duration
4 days

### Student Capacity
6, with a maximum of one student per workstation
**Business Intelligence Administration Training for CAD or RMS (IPST6004)**

Business Intelligence offers the ability to perform reporting and analysis from a data warehouse containing data from the I/CAD and/or inPURSUIT RMS databases. The Business Intelligence Solution provides powerful capabilities for the user to view and modify reports as needed and conduct ad-hoc queries from the data warehouse. Users can create dashboards and access widgets that will provide up-to-date information related to resources and help in accurate decision making. This course is designed for System Administrators and DBAs who want to become familiar with the setup and maintenance of Intergraph's Business Intelligence Solution for Public Safety. It will provide instructions on the setup, site specific configurations, and administrative tasks needed to maintain the Business Intelligence Solution.

### Major Topics
- Business Intelligence Software setup and configuration
- ETL Process and Scripts
- Configure and Execute ETL scripts
- Site Specific Customization and Maintenance
- CAD and inPURSUIT Universes
- Configuration, Hierarchies, and Relationships
- CAD, inPURSUIT and X-Celsius Reports
- Configuration, Scheduling, and Security
- Backups and Troubleshooting
- Business Intelligence – Databases & Concepts
- Data Warehouse, Landing Zone
- Data Lineage

### Prerequisites
- Familiar with Windows-based applications, administrative tasks, and agency workflows (for the General Administrator Training section of the course)
- Familiar with I/CAD database and familiar with Oracle or SQL Server databases (for the DBA training section of the course)

### Method
Conducted on-site or at an Intergraph Certified Training Facility by Intergraph Personnel

### Task Classifications
System Administrators, Database Administrators, and other Personnel responsible for administering and maintaining the Business Intelligence Solution.

### Project Phase
When the BI Solution from Intergraph is set up and sufficient CAD or RMS data is available for obtaining good sample reports

### Duration
3 days

### Student Capacity
6, with a maximum of one student per workstation
Business Intelligence User Training for CAD or RMS (IPST6005)

Business Intelligence (BI) offers the ability to perform reporting and analysis from a data warehouse containing data from the I/CAD and/or inPURSUIT RMS databases. The BI solution provides powerful capabilities for the user to view and modify reports as per needs and conduct ad-hoc queries from the data warehouse. In addition, with minimal knowledge of the underlying data structures, users can access and synchronize data from multiple sources, create custom formulas, and use variables within a single report. Users can also access dashboards and widgets that will provide up-to-date information related to resources and help with accurate decision making. This course is designed for the end user or administrator to familiarize them with the use of the BI application. It will provide instruction on viewing reports, modifying reports and creating new reports.

Major Topics

- Overview of the Universe(s) & Reports
- InfoView
- Accessing InfoView
- Navigating InfoView
- Workspace panel
- I/CAD or inPURSUIT Reports
- Collaborating on Reports
- Web Intelligence (WEBI)
- Navigate and view Web Intelligence Reports
- Perform ad hoc queries and analysis
- Modifying queries
- Formatting Reports
- Schedule Reports
- Learn benefits of Rich Client

- Widgets
- Searching and navigating to documents
- Creating Widgets
- Accessing Dashboards
- Live Office (Office 2007)
- Accessing reports from Office
- Accessing reports through Crystal Reports

Prerequisites

- Familiar with Windows based applications
- Familiar with CAD data or RMS data
- Familiar with agency workflows
- Familiar with Crystal Reports

Method

Conducted on-site or at an Intergraph Certified Training Facility by Intergraph Personnel

Task Classifications

System Administrator, Trainers, Business Intelligence operators or other Personnel responsible for reporting and analysis

Project Phase

When sufficient CAD or RMS data is available for good sample reports

Duration

4 days

Student Capacity

6, with a maximum of one student per workstation
Business Intelligence offers the ability to perform reporting and analysis from a data warehouse containing data from the I/CAD or inPURSUIT database. The Business Intelligence Solution provides powerful capabilities for the user to view and modify reports as needed and conduct ad-hoc queries from the data warehouse. Users can create dashboards and access widgets that will provide up-to-date information related to resources and help in accurate decision making. This workshop is to make an examination of the customer's current reports, the mappings of the data in the reports, the datasets used and any calculations that are used in the reports. The workshop would identify CAD or RMS data that is desired by the agency but may not be accessible currently. The Subject Matter Experts for each reporting datasets would attend to present current reports and methods of reporting.

Major Topics

- Business Intelligence Software setup and configuration
- Review of current Reports and dataset schema
- Review of calculations made in reports.
- Review of troublesome reporting.

Prerequisites

- Familiar with Windows-based applications, administrative tasks, and agency workflows
- Familiar with I/CAD or inPURSUIT RMS database and familiar with Oracle or SQL Server databases (for the DBA training section of the course)
- Familiar with all current reporting needs.

Method

Conducted on site or at an Intergraph Certified Training Facility by Intergraph Personnel

Task Classifications

System Administrators, Database Administrators, and other Personnel responsible for administering and maintaining the Business Intelligence Solution, current report solutions and reporting datasets.

Project Phase

Prior to the setup of the BI for CAD or BI for RMS Solution and shortly after project start.

Duration

4 days

Student Capacity

6, with a maximum of one student per workstation
**Business Intelligence Post-Implementation Workshop for CAD or RMS (IPST6007)**

Business Intelligence offers the ability to perform reporting and analysis from a data warehouse containing data from the I/CAD or inPURSUIT RMS database. The Business Intelligence Solution provides powerful capabilities for the user to view and modify reports as needed and conduct ad-hoc queries from the data warehouse. Users can create dashboards and access widgets that will provide up-to-date information related to resources and help in accurate decision making. This workshop is provided to follow-up with the customer after implementation to take a deeper look into the structure of CAD or RMS reports. It will cover in-depth report creation techniques and making any necessary adjustments for successful reports.

### Major Topics

- Report building techniques.
- Filtering, alerts, calculations
- Report adjustments and furthering the permissions for WEBI

### Prerequisites

- Familiar with Windows-based applications, administrative tasks, and agency workflows (for the General Administrator Training section of the course)
- Familiar with I/CAD or inPURSUIT RMS database and familiar with Oracle or SQL Server databases (for the DBA training section of the course)
- Attended Business User Training

### Method

Conducted on site or at an Intergraph Certified Training Facility by Intergraph Personnel

### Task Classifications

System Administrators, Database Administrators, and other Personnel responsible for administering and maintaining the Business Intelligence Solution.

### Project Phase

After successful Business Intelligence for CAD or RMS implementation and after some use by the agency.

### Duration

5 days

### Student Capacity

6, with a maximum of one student per workstation
Map Basics for I/CAD Systems (IPST8001)

The Map Basics for I/CAD Systems User course is presented to personnel responsible for the creation and maintenance of the I/CAD street map. The class is split into two sections, with the first being more workflow/schema based and the second part being map creation. As part of training, students will use actual data from their agency to receive hands-on practice in map creation and display options.

Note: This is not a full GeoMedia Pro or I/MapEditor training class – please see (IPST8005).

Major Topics

- Street Map Overview
- Map-related Database Structures
- Address Verification Explanation
- Polygon-based Deployment Plans
- Mapping Workflow Options
- GeoMedia Pro Introduction
- GeoMedia Pro Demo
- I/Map Editor Introduction
- Centerline Data and Network Creation
- Point Address data and Table Population
- Special Address Manipulations
- Enhancements, Aesthetics and Map File Options
- Showmap Application
- CAD, Mobile and Other Map Designs

Prerequisites

- Responsibility for data entry and/or map editing
- Knowledge of basic I/CAD terminology and mapping data tables
- Familiarity with area geography and operational requirements
- Familiarity with GeoMedia Professional to aid in the understanding and retention of Map Basics concepts

Method

Conducted on-site by Intergraph Personnel

Task Classifications

System Administrator, Mapping Support, Database Support, and Training personnel

Project Phase

After the map is ready for operations

Duration

4 days

Student Capacity

6, with a maximum of two students per workstation
## Map Maintenance for I/CAD Systems (IPST8003)

The Map Maintenance course familiarizes and emphasizes the map maintenance workflow to be carried out at the particular customer site. It will be a highly customized class, with subject matter depending on several important variables, such as whether the agency is maintaining its own map data, whether a local GIS provider is maintaining the map (and in what format), whether translation software is needed to make the workflow easier, and the frequency with which updates will be completed. It is expected that during this session the customer will modify the relevant MapEditor Training documentation where needed, to conform to their data and site conditions (share names, feature class names, attribute names colors, custom SQL scripts, etc.). At the end of the week, attendees of the class will update this document to include a complete description of the mapping process used to produce their map data for CAD. This helps to ensure that the customer has good understanding of their map production process and that the final documented process is specific to the customer rather than a generic one. The class will be conducted using the designated map maintenance workstation, and all required mapping software must be installed and functional.

### Major Topics

- Collection and Entry of Data
- Format of Source Data
- Mapping Workflow Details
- GeoMedia Pro Warehouse Connections
- Projections and Units of Measurement
- Map Data Validation and Manipulation
- Street Network Building
- Address Point Table Population
- Quality Control
- Map Publishing
- Map Data Deployment Discussion

### Prerequisites

- System Administration and/or responsibility for map creation/maintenance
- Complete familiarity with the process of map creation as it relates to the customer’s data, including knowledge of basic terminology and data tables
- Familiarity with relevant software, such as GeoMedia Pro, I/Map Editor, ESRI, FME, MicroStation

### Method

Conducted on-site by Intergraph Personnel

### Task Classifications

System Administrator and Mapping Support (Possible involvement by Database Support, and Project Management Personnel)

### Project Phase

After the method and theory of the customer's actual map maintenance has been resolved

### Duration

4 days, dependent on customer needs

### Student Capacity

6, with a maximum of one student per workstation (though only the designated maintenance machine can be used for certain workflows, in which case a projector would be required)
### Map Roll Consulting for I/CAD Systems (IPST8004)

The map roll consulting is conducted on-site in the presence of the relevant mapping personnel (responsible for the creation and maintenance of the I/CAD street map). As part of the consulting participants will witness the map roll procedure using source data from their GIS provider to create new map data and a CAD-ready map file. The consulting will involve little to no customer hands-on and will be mostly focused on design discussions, working through customer specific data issues and evaluating the use of various applications and tools in the map roll process. Due to the time available and the size of the customer's map data it is not guaranteed that a full map dataset will be processed during the class. If the mapping/admin machine is configured this should be utilized, otherwise the work will be performed using Intergraph machine, preferably with a projector.

### Major Topics

- Map Data Conversion Using New Source Data
- Data Validation
- Street Network Creation
- Special Address Point Table Population
- Polygon-based ESZs (as needed)
- Map Publishing
- Showmap Application
- Alter appearance of CAD Map for Agency Specific Uses (can include creation of a mobile map)
- Copy Map Files to Customer System
- Roll Map Tables to Customer Server(s)
- Deployment of Map Data and Files to User Workstations and Databases

### Prerequisites

- Responsibility for data entry and/or map editing
- Knowledge of basic I/CAD terminology and data tables
- Familiarity with GeoMedia Pro recommended
- Familiarity with area geography and operational requirements

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<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph Personnel</th>
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</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>System Administrator, Mapping Support, Database Support, and Training Personnel</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Second Intergraph map roll, normally prior to end user CAD training</td>
</tr>
<tr>
<td>Duration</td>
<td>4 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>6</td>
</tr>
</tbody>
</table>
### Map Workflow Reassessment (IPST8004)

The Map Reassessment session is designed for the Intergraph map consultant to further refine and streamline the map production process. During the Map Workflow Reassessment, the Intergraph consultant will review specific training and workflow topics as requested by the Customer, and make recommendations on process changes and map design items as appropriate.

#### Major Topics

- Workflow streamlining and data enhancement (e.g., adding routing attribution)
- Advanced training information on map environment system setup, administration and configuration, including the Map Build Utility

#### Prerequisites

- I/CAD System in use in live operations for a minimum of two months

#### Method

Conducted on-site or at an Intergraph Certified Training Facility by Intergraph Personnel

#### Task Classifications

System Administrator

#### Project Phase

If done during an initial implementation, one to two months after cutover is ideal

If done during an upgrade implementation, early in the upgrade process before the Delta training is best, so that any identified configuration changes may be incorporated into the upgrade

#### Duration

4 days

#### Student Capacity

6
**I/CAD Reassessment (IPST2006)**

The I/CAD Reassessment session is designed to bring the users and managers of the I/CAD system together with Intergraph system consultants experienced in center operations. The consultant will conduct structured group sessions to clarify the original goals of the project and will then review present operations on-site and assess how goals and objectives are being met. This information is the core of additional group sessions and helps to determine if progress is satisfactory or if adjustments must be made to goals and priorities. Recommendations will be made as to any configuration changes that should be performed to accomplish the goals and objectives, or other requests as they arise. These recommended system modifications may be accomplished during the week, depending on the scope and complexity of each item. Further implementation work may be required to perform more complicated configuration tasks, and these will be part of follow-on work provided during subsequent visits or contact.

**Major Topics**
- Review of Existing Utilities
- Instruction on New Utilities
- Use of Existing Functionality to Optimize the Operation of the Center
- Creation of a Current and Functional Computer Utilization Plan
- GUI, Command Line, or Other Configuration Changes
- Customized Training or Retraining of Specific Areas

**Prerequisites**
- I/CAD System in live operation for a minimum of two months

**Method**
- Conducted on-site by Intergraph Personnel

**Task Classifications**
- System Administrator, Key I/CAD Users, Training, and Management Personnel

**Project Phase**
- If done during an initial implementation, three to six months after cutover is ideal
- If done during an upgrade implementation, early in the upgrade process before the Delta training is best, so that any identified configuration changes may be incorporated into the upgrade

**Duration**
- 4 days

**Student Capacity**
- 12
**MPS Reassessment (IPST2007)**

The MPS Reassessment session is designed to bring the users and managers of the MPS system together with Intergraph system consultants experienced in field Mobile operations. The consultant will conduct structured group sessions to clarify the original goals of the project and will then review present operations on-site and assess how goals and objectives are being met. This information is the core of additional group sessions and helps to determine if progress is satisfactory or if adjustments must be made to goals and priorities. Recommendations will be made as to any configuration changes that should be made to accomplish the goals and objectives, or other requests as they arise. These recommended system modifications may be accomplished during the week, depending on the scope and complexity of each item. Further implementation work may be required to perform more complicated recommendations, and these will be part of follow-on work provided during subsequent visits or contact.

### Major Topics

- Review of Existing Utilities
- Instruction on New Utilities
- GUI or Other Configuration Changes
- Customized Training or Retraining of Specific Areas

### Prerequisites

- MPS in use in live operations for a minimum of two months

### Method

Conducted on-site or at an Intergraph Certified Training Facility by Intergraph Personnel

### Task Classifications

System Administrator, Key MPS Users and/or Supervisors, Training, and Management personnel

### Project Phase

If done during an initial implementation, one to two months after cutover is ideal
If done during an upgrade implementation, early in the upgrade process before the Delta training is best, so that any identified configuration changes may be incorporated into the upgrade

### Duration

4 days

### Student Capacity

12
RMS/FBR Configuration Training

Discusses options for configuring the RMS application. Teaches participants how to use the built-in configuration tools of the RMS. It also includes how to create security user accounts, permission groups, workflow roles, and determine decisions to be made. This enables users to get an early start on configuring the RMS application. This class also presents AFR workflow configuration options to enable the Agency to begin working on the AFR Workflow Configuration Template.

Major Topics

RMS
- Basic Navigation of RMS
- Creating User Accounts and Permission Groups in RMS
- Granting Permissions at Application, Menus, Table, and Functional Levels
- Creating Users and Assigning Permission Groups
- Documents and Image Security
- Creating and Maintaining RMS Code Tables
- Customizing the RMS Screens
- Adding Cross Edit Checks
- Setting Required Fields
- Customize Page Controls
- Making Fields Inactive and Invisible
- Changing Field Labels
- Modifying Field Colors
- Changing Grid Labels
- Modifying the Grid Column Displays
- Customizing Address Panels

FBR
- Basic Navigation of AFR
- Establishing AFR User Accounts
- Understanding AFR Roles
- Understanding AFR Workflow
- Understanding the AFR Configuration Template

Prerequisites

- Knowledge of basic agencies business process and form workflow
- An Introduction to Windows course or equivalent knowledge and familiarity with the Windows user interface

Method
Conducted on-site by Intergraph Personnel

Task Classifications
RMS Core Group; RMS Administrator(s)

Project Phase
After hardware has been installed and COTS RMS application has been installed.
## Duration
2 days

## Student Capacity
10 with a maximum of one student per workstation

## RMS/FBR System Administrator Training

This course instructs participants how to use the Administrator Utilities to maintain the RMS. The RMS Administrator training includes defining and maintaining user accounts and security definitions; creating and maintaining code tables; and configuring the RMS. It also includes technical discussion on interfaces, trouble shooting, etc. Support Issues will be discussed and how to better handle situations concerning connections and other items of concern. This course teaches users how to administer the FBR System. The topics cover creating and managing FBR users and their roles. The course will also provide instruction on troubleshooting the system.

### Major Topics

<table>
<thead>
<tr>
<th>RMS Topics:</th>
<th>FBR Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Overview</td>
<td>System Overview Hardware Environment</td>
</tr>
<tr>
<td>Hardware Environment</td>
<td>Software Environment</td>
</tr>
<tr>
<td>Software Environment</td>
<td>Interfaces</td>
</tr>
<tr>
<td>Interfaces</td>
<td>FBR Workflow Administrator (WFADMIN)</td>
</tr>
<tr>
<td>Configuration</td>
<td>Accessing WFADMIN – User Menu</td>
</tr>
<tr>
<td>User Account Management</td>
<td>Creating Roles and Workflow Users</td>
</tr>
<tr>
<td>Security Permissions Management</td>
<td>Managing User Accounts and Roles</td>
</tr>
<tr>
<td>Code Table Management</td>
<td>Temporarily Assigning User to Supervisor Roles</td>
</tr>
<tr>
<td>Customization Toolbox</td>
<td>Accessing WFADMIN - Troubleshooting and Maintain FBR Workflow</td>
</tr>
<tr>
<td>Address Server</td>
<td>Find Process Feature (to view detailed information about a single workflow instance)</td>
</tr>
<tr>
<td>Automatic Sequences</td>
<td>Process List (list of all workflow instances)</td>
</tr>
<tr>
<td>Text Index Maintenance</td>
<td>Status</td>
</tr>
<tr>
<td>RMS Workflow Configuration</td>
<td>Checkout</td>
</tr>
<tr>
<td>Document Viewer Configuration</td>
<td>Reassign</td>
</tr>
<tr>
<td>Audit Trail</td>
<td>Reassign Workflow</td>
</tr>
<tr>
<td>Web RMS Access</td>
<td>Understand Purge Workflow</td>
</tr>
<tr>
<td>Client Installation Instructions</td>
<td>View Workflow Errors</td>
</tr>
<tr>
<td>Basic Troubleshooting Guidelines</td>
<td>RMS / FBR Code Synchronization Process</td>
</tr>
<tr>
<td>Help Desk Procedures</td>
<td>Client Installation Instructions</td>
</tr>
<tr>
<td></td>
<td>Basic Troubleshooting Guidelines</td>
</tr>
<tr>
<td></td>
<td>Help Desk Procedures</td>
</tr>
</tbody>
</table>

### Prerequisites
- RMS Configuration Training
- Knowledge of Windows Operating Systems Administration
- Basic understanding of County's LAN and Mobile Network Infrastructure

### Method
Conducted on-site by Intergraph Personnel

### Task Classifications
RMS and FBR System Administrators

### Project Phase
Should be complete with adequate time to prepare for cutover
**Web Based Report Server / Ad hoc Report Builder Train-the-Trainer**

This course instructs students how to access, generate, and schedule reports that have been created and saved to the Report Server. Additionally, the course will provide training on the development of ad-hoc reports and the deployment of reports to the Report Server.

### Major Topics

- Overview of the Report Server Functionality
- Accessing the Ad Hoc Report Server
- Creating Ad Hoc Reports
- Report Query Editor
- Report Server Editor Sort Option
- Report Server Editor Filter Option
- Filter Condition Editor
- Create reports incorporating features
- Accessing Existing Reports
- Report Manager
- Scheduling Reports
- Publishing Reports
- Emailing Reports
- Ad Hoc Report Writer
- Deploying Reports to the Report Server
- Testing Reports in the Report Server
- Installation and Security Configuration
- Installation
- Security Configuration of the Report Server
- Permission Groups and User Security

### Prerequisites

- Some prior level/knowledge of report writing
- It is strongly recommended that students have a general understanding of SQL and relational database design.
- Knowledge of Windows Operating Systems Administration
- Basic Understanding of County’s LAN and Mobile Network Infrastructure

### Method

Conducted on-site by Intergraph Personnel

### Task Classifications

RMS Administrator(s) and Report Writers

### Project Phase

Should be complete with adequate time to prepare for cutover
<table>
<thead>
<tr>
<th>Duration</th>
<th>2 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Capacity</td>
<td>10 with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>

### RMS Train-the-Trainer

**Records & Administrative Personnel Train-the-Trainer Training:** This course is designed for Records and Administrative personnel. While it provides an overview of the FBR application, the primary focus of the course is on the RMS application.

**Major Topics**

- The course teaches participants to use the RMS modules to enter, track and manage data.
- It includes searching for data, generating reports, linking records and updating records in the RMS.
- Teaches participants to analyze, identify and correct UCR/NIBRS data inconsistencies using the UCR/NIBRS diagnostic tools and to generate UCR/NIBRS reports.
- For support/administrative personnel, it covers the Employee (Personnel) module, Applicant Tracking module, Position tracking module, Asset Management modules, Fleet Maintenance modules, Alarm Billing modules, etc.

**Prerequisites**

- Knowledge of the Agency's Records Department Business Processes
- Knowledge of basic public safety terminology
- An Introduction to Windows course or equivalent knowledge and familiarity with the Windows user interface

**Method**

Conducted on-site by Intergraph Personnel

**Task Classifications**

Agency Trainers

**Project Phase**

Training

**Duration**

8 days

**Student Capacity**

10 with a maximum of one student per workstation
**FBR Train-the-Trainer**

The FBR User Training course is designed to teach students to enter, save, and submit reports to workflow using the FBR forms. It teaches students how to take advantage of mobile and RMS query capabilities. The course will also teach supervisors to access reports for review, enter comments on reports, and approve/reject reports. Students will also learn how to use the RMS to search for and display data entered via the FBR.

### Major Topics

- User Groups and Roles
- FBR Navigation
- Working in Disconnected and Connected Mode
- Entering New Reports
- Form and Zoom Commands
- Views (Draft, InBox, Outbox, and Sent items)
- CAD Search (CFS and Incidents)
- Person and Vehicle Search (RMS, Local and Mobile)
- Local Database
- Search
- Save
- Form Validation Features and Tools
- Supervisor Review Comments
- Workflow
- Submit Operations (Submit/Reject/Resubmit/Approve)
- Saving Forms to Server
- Import Form/Data into RMS

### Prerequisites

- Knowledge of basic public safety terminology
- Knowledge of Agency’s report entry and approval business processes
- An Introduction to Windows course or equivalent knowledge and familiarity with the Windows user interface

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>Agency Trainers</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Training</td>
</tr>
<tr>
<td>Duration</td>
<td>2 days</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>10 with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>
**Crime Analysis Train-the-Trainer**

The course will teach students to display incident data via an ESRI-based Crime Analysis tool; to define and zoom in on specific crime hot spots; to build a comprehensive picture of crime trends; to develop custom queries; and to generate and analyze Trend Analysis reports.

<table>
<thead>
<tr>
<th>Major Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Mapper/Analyst Functions</td>
</tr>
<tr>
<td>- Using a Stored Query to Generate a Crime Map</td>
</tr>
<tr>
<td>- Generating and Saving a Wizard Driven Query</td>
</tr>
<tr>
<td>- Jurisdiction, Geographical Area, Post</td>
</tr>
<tr>
<td>- Querying By Date/Time</td>
</tr>
<tr>
<td>- Crime Types and Status, Property, MO, Person and Vehicle Information</td>
</tr>
<tr>
<td>- Using Themes</td>
</tr>
<tr>
<td>- Map Viewer</td>
</tr>
<tr>
<td>- Exporting Layers and Printing Maps</td>
</tr>
<tr>
<td>- Editing and Deleting Graphics</td>
</tr>
<tr>
<td>- Jurisdictional Viewing</td>
</tr>
<tr>
<td>- Adding and Removing Shape Files for Viewing</td>
</tr>
<tr>
<td>- Additional Tools for More Advanced Analysis</td>
</tr>
<tr>
<td>- Export</td>
</tr>
<tr>
<td>- Map to Image File</td>
</tr>
<tr>
<td>- Map to Clipboard</td>
</tr>
<tr>
<td>- Save Results of a Query to a Shape File</td>
</tr>
<tr>
<td>- Printing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Basic knowledge of Incident Mapping Tools</td>
</tr>
<tr>
<td>- Shape files</td>
</tr>
<tr>
<td>- Layers</td>
</tr>
<tr>
<td>- Basic Knowledge of RMS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted on-site by Intergraph Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Classifications</td>
<td>Agency Trainers and System Administrator(s)</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Training</td>
</tr>
<tr>
<td>Duration</td>
<td>2 days; includes ½ day of System Admin Training</td>
</tr>
<tr>
<td>Student Capacity</td>
<td>10 with a maximum of one student per workstation</td>
</tr>
</tbody>
</table>
Attachment F: Public Safety System Specifications

General Notes:

This document provides the specifications for hardware and software. The below specifications reflect technology that is currently considered standard and is routinely available from hardware vendors and should be used when purchasing new equipment. For those customers with existing hardware and planning on a software upgrade, these specifications are intended to serve as a guide for determining whether existing equipment should be upgraded or replaced to support a mission-critical configuration. These specifications apply to servers in any form factor, including rack mounted, blade, or standalone tower servers.

I/CAD Virtual Environment Requirements:

I/CAD servers, with the exception of our IIF/BizTalk server, has been certified to run in a virtual environment with VMware vSphere 4, provided the dedicated resources meet or exceed the hardware CPU, memory, and disk space requirements detailed in this document.

Licensing of the Windows Server OS, SQL Server, and especially Oracle have unique licensing requirements under VMware. Use of Oracle with VMware is typically very expensive to license and often makes that configuration cost prohibitive to implement.

For Communication / Interface servers, virtualizing the interface/communication server is supported. If there are any serial RS232 interfaces on the Communication / Interface server, then a serial-to-IP conversion device at the host level will be required since a virtualized interface server has no RS232 port. For a Serial-over-IP device Intergraph recommends the Digi PortServer® TS serial server.

http://store.digi.com/index.cfm?fuseaction=category.display&category_id=116

There are currently no plans to certify I/CAD clients with virtualization.

CAD / SAN Recommendations:

Intergraph recommends that customers follow Microsoft / Oracle best practices when configuring database storage for both performance and availability. The CAD 911 database is write intensive but typical IO rates will vary widely across implementations depending upon the number of users and number of applications accessing the system. For all customers, Intergraph requires implementing dedicated LUNs and RAID10 groups specifically for the CAD database files with as many fast spindles as your storage subsystem will allow. CAD 1 and CAD 2 databases must be on separate LUN groups within the SAN to insure optimal CAD system availability and performance. Customers should not implement RAID5 or RAID6 for the CAD database servers.

This document is Intergraph Knowledge Base Article ID 6706 and is available online at: http://trueblue.intergraph.com/Support/KnowledgeBase/kb.asp

1. System Hardware Specifications

**CAD Database Servers, including Web and Archive/Report Servers**

Please refer to Appendix B for more detailed information regarding the I/CAD database server hardware specifications noted below. The specifications are organized by I/CAD System size in effective seats. Effective seats are computed via the following formula:

\[
\text{Effective seats} = \# \text{ of I/Dispatcher Clients} + \# \text{ of I/Calltaker Clients} + (\# \text{ of I/MDT Clients})/5 + (\# \text{ of I/NetViewer Clients})/10 + (\# \text{ of I/NetDispatcher clients})/2
\]

As an example, a customer site with:

- 10 - I/Dispatcher Seats
- 5 - I/Calltaker Seats
- 100 – MDT Clients
- 50 - NetViewer Users
- 10 - NetDispatcher Users

Would equate to: 
\[
(10+5) + (100)/5 +(50)/10 +(10/2) = 45 \text{ Effective Seats}
\]

**Small Configuration: 1-50 Effective Seats**

Note: There is no external storage for this Server configuration, consists of 14 internal disks

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>2 Quad-Core, 2 GHz or better (Intel X5560)</td>
</tr>
<tr>
<td>Memory</td>
<td>32GB</td>
</tr>
</tbody>
</table>
| Disk Qty: (12) RAID10 15K RPM SAS for database files plus (2) RAID1 10K RPM SAS for OS and log files | (2) -146GB 10K disks \(^1\)  
(12) – 300GB 15K disks  |
| Windows Server 64bit     | Standard Edition                                   |
| RDBMS 64bit              | Standard Edition \(^2\)                             |
| Example Hardware         | Please refer to Attachment C - Configuration Diagram |

**Medium Configuration: 51-200 Effective Seats**

Note: There is no external storage for this Server configuration, consists of 14 internal disks

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>2 Six-Core, 2 GHz or better (Intel X5670)</td>
</tr>
<tr>
<td>Memory</td>
<td>48GB(^3)</td>
</tr>
</tbody>
</table>
| Disk Qty: (12) RAID10 15K RPM SAS for database files plus (2) RAID1 10K RPM SAS for OS and log files | (2) -146GB 10K disks  
(12) – 300GB 15K disks  |
| Windows Server 64bit     | Enterprise Edition                                 |
| RDBMS 64bit              | Enterprise Edition                                 |
| Example Hardware         | Please refer to Attachment C - Configuration Diagram |
Large Configuration: 201-500 Effective Seats

Note: For this Server configuration, consists of 6 internal disks, and 24 disks in external storage

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>2 eight-Core, 2 GHz or better (Intel X6550)</td>
</tr>
<tr>
<td>Memory</td>
<td>64GB$^3$</td>
</tr>
<tr>
<td>Internal Disk Qty: RAID1 15K RPM SAS for OS plus RAID10 15K RPM SAS for log files</td>
<td>6 -146GB 15K disks</td>
</tr>
<tr>
<td>External Disk Qty: RAID10 15K RPM SAS for database files</td>
<td>24 - 146 GB 15K disks$^1$</td>
</tr>
<tr>
<td>Windows Server 64bit</td>
<td>Enterprise Edition</td>
</tr>
<tr>
<td>RDBMS 64bit</td>
<td>Enterprise Edition</td>
</tr>
<tr>
<td>Example Hardware</td>
<td>Please refer to Attachment C - Configuration Diagram</td>
</tr>
</tbody>
</table>

$^1$ Hard drive size selection and total storage needs are dependent on call/report volume and data retention plans– high volume customers may require larger capacity disks.

$^2$ Enterprise Edition required for Oracle Data Guard implementations

$^3$ Windows Server Enterprise Edition required for server memory greater than 32GB

The usable storage capacity of a RAID 1+0 array is \((N/2) \cdot S_{\text{min}}\), where \(N\) is the total number of drives in the array and \(S_{\text{min}}\) is the capacity of the smallest drive in the array. It is recommended to use same size drive in the array.

Storage capacity examples:

- 24 - 146 GB drives with RAID 10 = 1752 GB total storage

**Interface-Communication Servers**

- Two Quad-core Xeon processors
- 16 GB Memory
- 6 - 146GB 15K RPM RAID disk drives
- Dual 1GB NIC Cards
- DVD drive
- 17" Flat Panel monitor, keyboard, and mouse (may be configured one per rack)
- Windows Server 2008 Standard Edition

**Off Site Backup CAD Servers**

Configure the CAD off-site backup Servers identically to their production counterparts.
Test / Training / Archive CAD Database Servers

Configure the test/training servers identically to their production counterparts, except OS and database can be Standard Edition.

Test and/or Training Interface Communications Servers

Configure the test/training servers identically to their production counterparts

Interoperability Framework / BizTalk Servers

- Non High Availability / Single Server configuration
  - Single or Dual Quad-core, 2.8Ghz Xeon processors
  - 16GB Memory
  - 6 - 146GB 15K RPM RAID disk drives
  - Windows Server 2008 Standard Edition

- High Availability / Four Server configuration – 2 BizTalk servers + 2 Database servers

BizTalk servers
- Single or Dual Quad-core, 2.8Ghz Xeon processors
- 16GB Memory
- 2 - 146GB 15K RPM RAID disk drives
- Windows Server 2008 Standard Edition

Database servers – configured in a MS Cluster
- Single or Dual Quad-core, 2.8Ghz Xeon processors
- 16GB Memory
- 2 - 146GB 15K RPM RAID disk drives
- Windows Server 2008 Enterprise Edition
- External Storage Array with (6) 146GB 15K RPM RAID disk drives

CAD Dispatcher / Calltaker Workstations

- 2GHz or faster Quad-core Intel processor, 64bit OS
- 6 GB Memory
- 250GB disk drive
- Dual 21” Flat Panel Display
- Multiple Monitor Support
- Monitor Sound Bar or External Speakers
- DVD drive
- Single 1GB NIC Card
- Tower configuration
- XP SP3 / Windows Vista SP1 / Windows 7 Professional (32 bit or 64 bit)
Mapping Workstation Specifications

General Map Dataset Size Guidelines:

Small to Medium dataset

- Small to medium city or rural county
- Estimated street centreline count is less than 200,000 and address point count is less than 200,000

Large dataset

- Highly urbanized city/county, multi-county, or state
- Estimated street centreline count is greater than 200,000 or address point count is greater than 200,000

Type 1 Configuration – Small to Medium Dataset, database is local on map workstation

- Operating System (OS) – Window 7 Pro 64bit
- Quad Core Intel Xeon 2.4GHz or better
- 6GB, 1333MHz, DDR3 RAM or better
- 4 Hard Drive Configuration
  - C: 250GB 7200rpm HD or better for OS and Apps
  - E: 250GB 7200rpm HD or better for GeoMedia project folder
  - F: 250GB 7200rpm HD or better for SQL Server Map Staging Database
  - G: 250GB 7200rpm HD or better for SQL Server log file and primary page file
- 256MB Graphics Card or better
- Gigabit Network Card or better

Type 2 Configuration – Small to Medium Dataset, database is Client / Server

- Operating System (OS) – Windows 7 Pro 64bit
- Quad Core Intel Xeon 2.4GHz or better
- 6GB RAM or better
- 500GB 7200rpm Hard Drive or better
- 256MB Graphics Card or better
- Gigabit Network Card or better

Type 3 Configuration – Large Dataset, database is local on map workstation

- Operating System (OS) – Window 7 Pro 64bit
- Quad Core Intel Xeon 2.5GHz or better
- 12GB, 1333MHz, DDR3 RAM or better
- 4 Hard Drive Configuration
  - C: 250GB 7200rpm HD or better for OS and Apps
  - E: 250GB 7200rpm HD or better for GeoMedia project folder
  - F: 250GB 7200rpm HD or better for SQL Server Database
  - G: 250GB 7200rpm HD or better for SQL Server log file and primary page file
- 256MB Graphics Card or better
- Gigabit Network Card or better

Type 4 Configuration – Large Dataset, database is Client / Server

- Operating System (OS) – Windows 7 Pro 64bit
- Quad Core Intel Xeon 2.5GHz or better
- 12GB RAM or better
- 256GB Solid State Hard Drive or better
• 256MB Graphics Card or better
• Gigabit Network Card or better

Mobile Data Computers / Laptops

• Ruggedized IBM PC compatible
• Dual Core processor
• 4 GB of RAM
• 80 GB hard drive
• RS-232 for radio connection and also for AVL if desired
• 1024X768 resolution display
• Centronics Port for printing, if appropriate
• Network connection if to be docked on the network
• Touch screen is preferred

GPS Units

Note: Intergraph AVL products only support the protocols listed below. Devices that support one of these protocols should be compatible with the Intergraph I/Tracker product.

Protocols supported
• NMEA (National Marine Electronics Association)
• TAIP (Trimble ASCII Interface Protocol)
• OpenSky Subscriber Application Interface (M/A-COM Tyco Electronics – Revision 1.3)
• BlueTree (IO Management and Event Reporting for the BlueTree 4000 and 5000 Series – Version 1.0)

Business Intelligence Servers

BI - Application Server (Qty 1)

• One (1) Intel Xeon X5560 Quad Core, 2.8Ghz Processor
• 16 GB RAM
• Two (2) 146GB 15K RPM SCSI Hard Drives (in RAID 1 configuration)
• NIC: Two (2) Integrated Broadcom NetXtreme II 5708 Gigabit NICsTOE Capable
• Windows Server 2008 SP1 Standard Edition (64 bit)

BI - ETL and Database Servers (Qty 2)

• One (1) Intel Xeon X5560 Quad Core, 2.8Ghz Processor
• 32 GB RAM
• Six (6) 146GB 15K RPM SCSI Hard Drives (2 in RAID 1 for OS and 4 in RAID 5)
• NIC: Two (2) Integrated Broadcom NetXtreme II 5708 Gigabit NICsTOE Capable
• Windows Server 2008 SP1 Standard Edition (64 bit)
Business Intelligence Workstations

**Minimum Hardware Requirement for Business Intelligence & Crystal Reports 2008**
- 2.0 GHz Pentium 4-class processor
- 2 GB RAM
- 100 BaseT network card
- 4.9 GB hard disk space for BusinessObjects Enterprise

**Supported Operating Systems**
- Windows XP SP2 Professional (all 32-bit and 64-bit editions)
- Windows Vista (all 32-bit and 64-bit editions)

**Supported Browsers (Required for Report Viewer and Web Intelligence)**
- Microsoft Internet Explorer

---

**inPursuit RMS Servers**
- Dual, 8-core Xeon Processors
- 64 GB RAM
- 6 – 300GB, RAID1 or RAID10 with 15K RPM SAS
- Quad 1 GB NIC Cards

**inPursuit RMS Database SAN storage**
- 2 TB Available Disk Space (minimum storage)
- RAID1 or RAID10 configuration

---

**inPursuit FBR Server**

**inPursuit Interface Server**

**inPursuit Report Server/WebRMS/ Server**
- Dual, 8-core Xeon Processors
- 16 GB RAM
- 6 – 146GB, RAID1 or RAID10 with 15K RPM SAS
- Quad 1 GB NIC Cards

---

**inPursuit Workstations**
- 4 GB Memory
- 2GHz or faster Quad-core Intel processor
- 250GB disk drive
- Single 1GB NIC Card
- 1024x768 minimum resolution
System Software Specifications

**CAD Version 9.1.x  RADO/DBRecover systems**

Operating system – CAD servers
- Windows Server 2003 R2 SP2 (x64 H/W and O/S)
- Windows Server 2008 SP1 (x64 H/W and O/S)
- Windows Server 2008 R2 (x64 H/W and O/S)
- Oracle Linux 5 x64 (for Oracle DB server only)

Operating system – Interface / Comm servers
- Windows Server 2003 R2 SP2 (x64 H/W and O/S)
- Windows Server 2008 SP1 (x64 H/W and O/S)
- Windows Server 2008 R2 (x64 H/W and O/S)

Database Software
- SQL Server 2008 SP2
- Oracle: 11.2.0.1 (11GR2)

Client Operating Systems
- Windows XP SP3 (32 bit and 64 bit)
- Windows Vista SP1 (32 bit and 64 bit)
- Windows 7 Professional (32 bit and 64 bit)

Browser: Internet Explorer 7.0 / Internet Explorer 8.0

**CAD Version 9.1.x  High Availability systems using SQL Server Mirroring or Oracle Data Guard**

Operating system – CAD servers
- Windows Server 2008 SP1 (x64 H/W and O/S) – for either Oracle or SQL Server
- Windows Server 2008 R2 (x64 H/W and O/S) – for SQL Server and Oracle 11gR2 only
- Oracle Linux 5 x64 (for Oracle DB server only)

Operating system – Interface / Comm servers
- Windows Server 2003 R2 SP2 (x64 H/W and O/S)
- Windows Server 2008 SP1 (x64 H/W and O/S)
- Windows Server 2008 R2 (x64 H/W and O/S)

Database Software
- SQL Server 2008 SP2; For the Witness - SQL Server 2008 SP2 (Express Edition or greater)
- Oracle: 11.1.0.7 (11gR1) or 11.2.0.1 (11gR2) - Enterprise Edition required for Data Guard support

Client Operating Systems
- Windows XP SP3 (32 bit and 64 bit)
- Windows Vista SP1 (32 bit and 64 bit)
- Windows 7 Professional (32 bit and 64 bit)

Note: Windows 7 only supported for SQL Server or running Oracle client 11GR2 (32 bit and 64 bit). Oracle does not support the Windows 7 OS with 11GR1.

Browser: Internet Explorer 7.0 / Internet Explorer 8.0

CAD Database servers and comm servers were certified in a virtual environment with VMware vSphere 4
inPURSUIT RMS Version 11.5

Server Database Software

- Oracle 11g Standard Edition

Server Operating System Software

- Windows Server 2008 Enterprise Edition for RMS application servers (64-bit)

Client Workstation Operating System Software

- Windows XP & Windows 7 Pro (32-bit or 64-bit)
Appendix A

Operating System Best Practices

Overview:

How the operating system is configured can greatly impact the installation and setup of the Intergraph specific applications downstream. Taking steps early in the setup of the server to ensure a proper configuration will make later software installation and configuration far easier.

Machine Names:

Every computer is given a name that can be used to access resources on that machine. This is often referred to as the node name, NetBIOS name, or machine name. This is probably the one aspect of standard server configuration that is likely to be dictated by the customer. It is not uncommon for large IT organizations to have naming conventions in place (Called UNC – Universal Naming Convention) that they want applied to all devices within the span of their control.

The following table shows the desired server name conventions for a standard I/CAD installation should the customer have no preference:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Suggested Node Name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary CAD Database</td>
<td>CAD01</td>
<td></td>
</tr>
<tr>
<td>Secondary CAD Database</td>
<td>CAD02</td>
<td></td>
</tr>
<tr>
<td>Primary Com/Interface</td>
<td>CADCOM01</td>
<td></td>
</tr>
<tr>
<td>Additional Com/Interface</td>
<td>CADCOM02</td>
<td>Increment number as needed (CADCOM03, etc.)</td>
</tr>
<tr>
<td>CAD Training Server</td>
<td>CADTRAIN01</td>
<td></td>
</tr>
<tr>
<td>CAD Test Server</td>
<td>CADTEST01</td>
<td></td>
</tr>
<tr>
<td>Mapping Server</td>
<td>CADMAP01</td>
<td></td>
</tr>
</tbody>
</table>

Machine names should be finalized before the database applications are installed. This is far more important in an Oracle setup that in SQL Server but is best to have the names cemented before application installation and setup occurs.

Domain:

If the customer is using an existing domain, the machines will have to be joined to the domain by a customer who has a domain administrator account. Intergraph does not generally provide domain setup for customers. If your site is standing up a domain for the first time, and Intergraph is responsible for its configuration, consult the domain setup document created by Intergraph for use in public safety.
*Important* Note: If you are going to use SQL Server Database Mirroring as your high availability solution, it is important to obtain a domain login that can be used as a service account for running the database related services. The account will need administrator privileges on the local machines running the database applications, but do not need to be domain administrator accounts. The passwords should be set to never expire.

**User Accounts:**

The only user account Intergraph should configure on the server is the local administrator account. The password should be conveyed to Intergraph services staff. This allows all Intergraph staff working on the project to know a definitive way to access administrator privileges on the machine.

If the customer has a domain and the machines are joined to the domain, the customer may choose to create domain level logins for Intergraph personnel. If this is the case, then each Intergraph domain account should be added to the local administrator user group on each server and workstation in the I/CAD system. Intergraph personnel should not accept a domain administrator account from a customer. These accounts carry significant ability to alter core parts of the customers active directory structure, and we should avoid being in a position to have those responsibilities.
Appendix B

Small Configuration (1-50 Effective Seats)

RAID 1 Mirrored Pair for OS and Intergraph Files (2 disks)

RAID 10 for Database Files (12 disks)

**All drives are internal to the server**
Medium Configuration (51-200 Effective Seats)

RAID 1

RAID 1 Mirrored Pair for OS and Intergraph Files (2 disks)

Disk 0  Disk 1

RAID 10

RAID 0

RAID 10 for Database Files (12 disks)

**All drives are internal to the server**
Large Configuration (201-500 Effective Seats)

**6 Internal Server Disks**

RAID 1 Mirrored Pair for OS and Intergraph Files (2 disks)

RAID 10
RAID 0

RAID 10 for Intergraph Files (4 disks)

**24 External Storage Disks**

2 Drives used for Hot Spares

RAID 10
RAID 0

RAID 10 for Database Log Files (4 disks)

**RAID 10**

RAID 10 for Database Files (18 disks)
## SOW Attachment G: Acceptance Test Plan Overview

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<th>Description</th>
<th>Page</th>
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</thead>
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<td>Functional Test</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>CAD Stress Test</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Non-Production Environment Test</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Performance Test</td>
<td>3</td>
</tr>
<tr>
<td>5.1</td>
<td>I/CAD Subsystem</td>
<td>4</td>
</tr>
<tr>
<td>5.2</td>
<td>Mobile for Public Safety Subsystem</td>
<td>5</td>
</tr>
<tr>
<td>5.3</td>
<td>inPURSUIT RMS Performance Standards</td>
<td>6</td>
</tr>
<tr>
<td>5.4</td>
<td>inPURSUIT Field Based Reporting (FBR) Performance Standards</td>
<td>7</td>
</tr>
<tr>
<td>5.5</td>
<td>inPURSUIT CAGIS Performance Standards</td>
<td>8</td>
</tr>
<tr>
<td>5.6</td>
<td>inPURSUIT Report Server and Ad-Hoc Report Writer</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>System Reliability Test</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>System Availability Test</td>
<td>11</td>
</tr>
</tbody>
</table>
1 Acceptance Testing Overview

Intergraph has included several levels of formal testing including the following:

- Functional Acceptance Test
- CAD Stress Test
- Non-Production Environment Test
- Performance Test
- Reliability Test
- Availability Test

The battery of tests are conducted both pre-Cutover and post-Cutover of the System. Before the System is Cutover to live operations, Intergraph will work in conjunction with the Customer to conduct functional test, CAD Stress Test, Non-Production Environment Test and an initial Performance Test. After Cutover of the System, Intergraph and the Customer will conduct the Performance, Reliability and Availability Tests.

2 Functional Test

Functional Testing occurs both informally and formally. Intergraph will informally test their Systems throughout the implementation before beginning the Formal Functional Acceptance Test Process. The Customer will be provided an opportunity, and is encouraged, to conduct informal testing of the System as well. The Customer will be able to begin informal System testing on the commercial, off-the-shelf (COTS) products following the configuration workshops. All informal testing must be completed prior to formal the Functional System Test.

Intergraph will provide our Standard Functional Acceptance Test Plan to formally verify system functionality. The Customer will review the Standard Acceptance Test Plan and can add additional site-specific scenarios and tests, as long as the scenarios and tests comply with the Customer’s original functional requirements. Intergraph will review all site-specific scenarios and tests added by the Customer. Intergraph and the Customer will mutually agree upon the final Functional Acceptance Test.

With assistance from Intergraph, the Customer will conduct Functional Tests on the CAD/MPS Subsystem and the Law RMS/FBR Subsystem to verify that that commands work as intended within mutually developed test scenarios, and that each Subsystem and its associated interfaces function according to Standard Functional Acceptance Test Plan.

At the conclusion of the Functional Acceptance Test development, the Customer will have the ability to use the Functional Tests to perform independent testing of the system, prior to the formal on-site Functional Testing Process with Intergraph. Intergraph recommends that the Customer perform the independent testing to validate the Functional Test scenarios and submit any potential changes to Intergraph before beginning formal testing.

With assistance from Intergraph, the Customer will conduct formal Functional Acceptance Test on the system to verify that that commands work as intended within the Customer-developed test scenarios.

During formal Functional System Test, Intergraph and the Customer will track whether requirements pass or fail a test. If a requirement fails a test, it will be classified as a “Failure.” Intergraph shall have up to ten (10) days to correct any Failure or provide an explanation of when the Failure will be corrected. Once a Failure is corrected, Intergraph and the Customer will conduct additional testing of that requirement to verify that it passes the test.
The System will be deemed to have passed Functional System Test when all requirements pass the test or mutually acceptable remedies for the Failures have been developed.

3 CAD STRESS TEST

The purpose of the CAD Stress Test is to verify the System meets the peak load level standards as defined in the Statement of Work. The Customer will conduct a Stress Test on the CAD Subsystem before Cutover. The Customer has the option to either create a “live” CAD test by manually creating events in CAD, and performing commands, or use Intergraph’s automatic load generation utility to simulate dispatch operations in a live environment for basic call taking and dispatching commands. The Customer may also use a combination of both methods.

If the Customer chooses to use Intergraph's automatic load generator utility, Intergraph will perform the equivalent of a live load, testing the Subsystem for a minimum period of 3 hours. The utility will simulate event entry only with address validation, unit dispatch, unit en route, unit arrive, and unit clear commands; it cannot automatically simulate unit recommendations. Intergraph will configure the load test simulator with site-specific CAD data (such as valid Customer street address and commonplace names, Customer specific event types, and police and fire units, etc). The utility will simulate a system transaction load corresponding to a rate of at least 100 dispatched incidents per hour.

Intergraph’s load test utility is only available for CAD; a load test utility for the MPS or interfaces is not available. Load testing is also not offered for the RMS subsystems.

Should the CAD Subsystem not conform to expected peak load level standards, Intergraph will take steps to bring the System into conformance with the stated peak load level standards before Subsystem Cutover can occur.

4 NON-PRODUCTION ENVIRONMENT TEST

Once each Subsystem has been demonstrated to operate in accordance with the Functional Tests and the configuration is “frozen,” Intergraph or its Subcontractor(s) will replicate the production environment into the remaining environments (Test, Training, and Backup/Disaster Recovery environments). The Customer will perform the tasks necessary to implement the RMS database replication utilities in the Backup/Disaster Recovery environment, if applicable.

Intergraph or its Subcontractor(s) and the Customer will test that the Test/Training and Backup/Disaster Recovery environments function as intended. Subsystem Cutover cannot occur until Intergraph or its Subcontractor(s) and the Customer mutually agree that all tests are passed and the Subsystem works in the environment as intended and/or mutually acceptable remedies for the Failures have been developed.

5 PERFORMANCE TEST

The purpose of the Performance Test is to verify that each Subsystem meets the transaction performance standards defined below. The Customer will be responsible for conducting the Performance Test and will be expected to do so several times during the implementation process and during the Reliability Period.
For the purposes of Performance Test, command transactions times are measured from operator action until visual response or operation completion. In the CAD/MPS Subsystem, query transactions are performed in the background while the operator continues to perform other tasks and are measured from the time the operator submits the query until the time the operator is notified that the query is complete. In the RMS/FBR Subsystem, query transactions are not performed in the background, and are measured from the time the operator submits the query until the time the query results are displayed to the operator.

The Customer can conduct any performance test it desires, but must be able to systematically document and track any discovered performance deficiencies, including detailed information as to the sequence of events leading up to the problem, time of day, node name or unit involved, and other pertinent details.

If performance degradation, defined as a replicable inability to meet the performance standards defined in the Statement of Work, is discovered, the Customer may choose to stop use of the application or use whatever operational portion may be available. The Customer, Intergraph and/or its Subcontractor(s) will determine a mutually acceptable error level and remedy.

### 5.1 I/CAD Subsystem

For the I/CAD subsystem, performance standards are based on the following assumptions:

- The I/CAD System is configured and maintained according to Intergraph recommendations for workstation, system and application configuration, as well as for database maintenance
- Anti-virus scanning software installed by Customer on the CAD system must be configured according to Intergraph’s Best Practice guide for Anti-Virus settings for CAD
- Minimum network speed is between CAD1 and CAD 2 servers = 100Mb/sec
- A maximum average round-trip latency (as measured by “ping”) of 10ms between the primary and secondary database servers, and 30ms between call taker/dispatcher workstations and the database servers

Subject to the Customer meeting the I/CAD performance assumptions, Intergraph commits to the following CAD subsystem response times:

Less than 1 second for 90 percent of the following Dispatcher commands:

- Accept Event
- Unit Status Change
- Add Event Comment
- Dispatch Unit
- Close Event

Less than 2 seconds for 90 percent of the CAD transactions which require geographic validation

Less than 5 seconds for 90 percent of the amplifying information:

- Unit and incident history queries
- Premise history queries
- Status queries

Less than 5 seconds for 90 percent of queries performed as background operations

- Seconds to minutes for reports performed as background operations
Many factors can impact response time, including network latency, complexity of the map display, and interaction with external systems and data volumes retained on the production database servers. For example, Intergraph recommends the Customer retain a maximum of 30 days of NCIC query response text be retained on the production database and move NCIC response data older than 30 days to a separate archive server.

The majority of the I/CAD application commands will meet the criteria stated above. However, commands requiring responses from external data sources, such as queries to external systems, may take longer based on the responsiveness of the external system and the network.

Compound commands that perform multiple operations for the Dispatcher upon selection of a single command might not meet the stated response times. An example of a compound command is the Traffic Stop command, which automatically spawns Create Event, Dispatch Unit, and Add Supplemental Information commands.

With regard to external database queries, the system will meet the performance requirement in most cases. However, due to factors such as network latency and external system responsiveness, it is not possible to commit to the response time for all ad hoc external database query requests.

Please note that Intergraph cannot guarantee response times where that response time depends on the performance of the network, system load, and any external systems (i.e., queries to state databases).

5.2 **Mobile for Public Safety Subsystem**

The Mobile for Public Safety performance standards are based on the following assumptions:

- Assumes either a commercial or managed IP-based wireless network with minimum network speed between MPS and the Communication server of at least 56kb/sec
- Acceptable performance for mobile transactions shall be defined as achieving two-way (query and response) transactions on a channel without congestion (i.e., no delay for channel access due to traffic contention)

Subject to the Customer meeting the MPS performance assumptions, Intergraph commits to the following response times:

- Typically less than 30 seconds for 90 percent of the mobile dispatch reports and queries
- Seconds to minutes for reports performed as background operations, such as Location of Interest and Unit History reports

Note that the Mobile for Public Safety response time does not apply to:

- Files with images or attachments, such as mug shots
- I/Informer transactions
- Queries to external systems
- Functions that are size and complexity dependent (i.e., report generation)

Please note that Intergraph cannot guarantee response times where that response time depends on the performance of the network, system load, and any external systems.
5.3 **inPursuit RMS Performance Standards**

The *inPursuit RMS* performance standards are based on the following assumptions:

- The *inPursuit RMS* applications are configured and maintained according to Intergraph recommendations for workstation, system and application configuration, as well as for database maintenance.
- The workstations used to access the *inPursuit RMS* applications meet the recommended Intergraph workstation specifications.
- The servers housing the *inPursuit RMS* applications meet the recommended Intergraph server specifications.
- Client RMS to the RMS Server must maintain a constant connection speed of 100Mbps for optimum performance, since response time for query transactions, searches and canned reports will depend greatly on the network connection speeds.

Intergraph is not responsible for the following factors, which are beyond the control of its applications.

- Network noise, throughput drop-offs, network activity spikes and third party applications operating on the workstation clients, which will directly influence the response times of the *inPursuit RMS* applications
- Anti-virus scanning software configuration, client registry errors, firewalls, and spyware that may affect performance
- Functions requiring responses from external data sources, such as queries to external systems, which may take longer based on the responsiveness of the external system and the network

Subject to above noted assumptions and exceptions, Intergraph commits to the following performance standards:

- **Basic Query & Select Response Times**
  
  With the exception of large reports or database searches that cover a time span of a week or more or require multiple passes through the System's databases and excluding network communication times and other delays beyond the System control, the RMS will complete all activities with a transaction Response Time of 3 seconds or less.
  
  Data entry operations (i.e., manual entry of information into data entry fields) and option selections (e.g., selecting one or more alternatives from drop down menu, selecting tools off a tool bar, activating a menu option, etc. with a pointing device or keyboard command) are completed nearly instantaneously with a response time of 1 second or less.
  
- **Extended Records Queries**
  
  The RMS will provide query responses via partial data requests of RMS records within 7 seconds. This will be limited by the number of records returned. Returns exceeding the pre-defined query return thresholds of 250 records will require more than 7 seconds. Searches utilizing the Advanced Search function that provides Boolean searches may exceed this limit.

The System will complete Transaction Response Times in 7 seconds or less, excluding latency associated with network connectivity and other systems that are outside of the control of Intergraph/Intergraph (i.e., latency with Jail systems).

With regard to external database queries, the System will meet the performance requirement in most cases. However, due to factors such as network latency and external system responsiveness, it is not possible to commit to the response time for all ad hoc external database query requests.
Please note that Intergraph cannot guarantee response times where that response time depends on the performance of the network, system load, and any external systems (i.e., queries to state databases).

5.4 inPURSUIT Field Based Reporting (FBR) Performance Standards

The inPURSUIT FBR performance standards are based on the following assumptions:

- The inPURSUIT applications are configured and maintained according to Intergraph recommendations for workstation, system and application configuration, as well as for database maintenance.
- The workstations used to access the inPURSUIT applications meet the recommended Intergraph workstation specifications.
- The servers housing the inPURSUIT applications meet the recommended Intergraph server specifications.
- All network connectivity for inPURSUIT FBR clients MUST BE IP-based networks. Public Wireless Networks (AT&T, Verizon, or Sprint), and Public Wireless Networks must provide 3G connectivity minimum (EVDO, EDGE, etc.) (unlimited access wireless data plans are required). Other available Public Wireless providers can be evaluated. Intergraph recommends the use of public wireless networks by the Customer.

With regard to RF Radio Networks, Intergraph provides the following caveats:

- Radio networks may be supported, but will have significant impact on application performance for system updates, queries, report submission, and response times, and will not be subject to the performance standards stated within this document.
- Radio networks require the use of IP-encapsulation software.
- RadioIP, Data Radio or NetMotion may be implemented.
- Constant connection speeds of 26.5kbps are required.
- FBR client updates and system updates become unavailable.
- Image and Document attachment capabilities are not permitted.
- RF Networks are not recommended for FBR.

Intergraph is not responsible for the following factors, which are beyond the control of its applications:

- Response time for query transactions, searches, and canned reports will depend greatly on the network connection speeds.
- Network noise, throughput drop-offs, network activity spikes and third-party applications operating on the workstation clients, all of which will directly influence the response times of the inPURSUIT applications.
- Anti-virus scanning software configuration, client registry errors, firewalls, and spyware may affect performance.
- Functions requiring responses from external data sources, such as queries to external systems, which may take longer based on the responsiveness of the external system and the network.

Subject to the above noted assumptions and exceptions, Intergraph commits to the following performance standards:

- Local FBR queries to the local client SQL CE database for names, vehicles and CAD data will be completed within 3 seconds. FBR transactions and queries to the RMS over-the-air (wireless network) are not subjected to the 3-second response due to wireless network traffic and server response.
- Local FBR Transactions.
• The FBR provides the ability to query the local FBR database for CAD data, name data and vehicle data. Query return and display of results from standard FBR forms queries against the local SQL CE database will be returned within 3 seconds

• Selecting drop-down menu pick-list items will be provided within 1 second

• Generation and display of report forms from the “New” report menu will be provided within 7 seconds

The form load time will be very dependent upon the mobile/FBR client workstation hardware memory specifications required by the application.

FBR Workflow, Retrieval and Submissions

Loading of existing saved draft reports, reports from a user’s inbox and submission of reports may take longer than 7 seconds. The time for submitting and saving reports to server may also exceed 7 seconds. This transaction time will be contingent upon the number of included data elements in a draft or completed report, any media attachments associated with the form, and the number of reports a user allows to be queued in their inbox.

With regard to external database queries, the system will meet the performance requirement in most cases. However, due to factors such as network latency and external system responsiveness, it is not possible to commit to the response time for all ad hoc external database query requests.

Please note that Intergraph cannot guarantee response times where that response time depends on the performance of the network, system load and any external systems (i.e., queries to state databases).

5.5 inPursuit CAGIS Performance Standards

The inPursuit CAGIS performance standards are based on the following assumptions

• The inPursuit applications are configured and maintained according to Intergraph recommendations for workstation, system and application configuration, as well as for database maintenance

• The workstations used to access the inPursuit applications meet the recommended Intergraph workstation specifications

• The servers housing the inPursuit applications meet the recommended Intergraph server specifications

• Client CAGIS to the RMS/CAGIS Server must maintain a constant connection speed of 100Mbps for optimum performance, since response time for query transactions, searches, and canned reports will depend greatly on the network connection speeds

Intergraph is not responsible for the following factors, which are beyond the control of its applications:

• Network noise, throughput drop-offs, network activity spikes and third party applications operating on the workstation clients, all of which will directly influence the response times of the inPursuit applications

• Anti-virus scanning software configuration, client registry errors, firewalls, and spyware that may affect performance

• Functions requiring responses from external data sources, such as queries to external systems, may take longer based on the responsiveness of the external system and the network
Subject to above noted assumptions and exceptions, Intergraph commits to the following performance standards:

- **Basic Query & Select Response Times**
  
  With the exception of large reports or database searches that cover a time span of a week or more or require multiple passes through the System's databases and excluding network communication times and other delays beyond the System control, the CAGIS system will complete all activities with a transaction Response Time of 3 seconds or less.

  Option selections (e.g., selecting one or more alternatives from dropdown menu, selecting tools off a tool bar, activating a menu option, etc. with a pointing device or keyboard command) are completed nearly instantaneously with a response time of 1 second or less.

**Extended RMS/CAGIS Queries**

- CAGIS will provide query responses via partial data requests of CAGIS records within 7 seconds
- This time will be limited by the number of records returned. Returns exceeding query return thresholds of 250 records will require more than 7 seconds
- The System will complete Transaction Response Times in 7 seconds or less excluding latency associated with network connectivity and other systems that are outside of the control of Intergraph

Extensive queries of data over more than a single month that include additional incident parameters such as modus operandi, offense types, person involvement filters, vehicles and location filters will require additional time processing results and generating the map display.

With regard to external database queries, the system will meet the performance requirement in most cases. However, due to factors such as network latency and external system responsiveness, it is not possible to commit to the response time for all ad hoc external database query requests.

Please note that Intergraph cannot guarantee response times where that response time depends on the performance of the network, system load, and any external systems (i.e., queries to state databases).

### 5.6 InPursuit Report Server and Ad-Hoc Report Writer

The Customer will use the Report Server and Ad Hoc Report Writer applications for ad hoc report generation and creation. Since these applications are not part of the base system, they are not guaranteed to meet any performance requirements.
6 SYSTEM RELIABILITY TEST

Upon cutover to production, the System will enter a thirty (30) day Reliability Test by which the system will perform in a live environment. Intergraph commits that the System will operate in material conformity with Product Specifications. Should the System fail to be in conformity with Product Specifications, Intergraph will take appropriate steps to bring the System back into compliance by correcting the problem in the manner and within the resolution time agreed to below. At the successful completion of this Reliability Test period, the System will be deemed accepted and payment will be made as outlined in the Agreement. Successful completion of the Reliability Test period will be achieved thirty (30) days from Cutover based on the stipulations outlined below. Final Acceptance of the System will not be withheld for errors noted below as P3 and P4.

**Error Level 1 (P1)** — Critical system errors that are defined as Loss of Data, Corruption of Data, or Loss of Productive Use of the System. In the event this type of error occurs, the Customer will immediately notify Intergraph and the Reliability Test period will be cancelled. Intergraph personnel shall promptly resolve the problem at no additional cost to the Customer and a new Reliability period will begin. Upon receipt of a P1 software correction the Customer has 24 hours to test the software correction and place it into production. If the Customer does not place the software correction into production within 24 hours, the new Reliability period will begin. Once the system operates for thirty (30) consecutive days without an Error Level 1, the Reliability Test will be completed.

**Error Level 2 (P2)** — Critical errors which are defined as the primary purpose of the Intergraph Application Software (or Module) is compromised, productive use of the System is significantly impacted, a procedural workaround is not immediately and readily available or has significant operational impact. In the event this type of error occurs, the Customer will immediately notify Intergraph and the Reliability Test period will be suspended. Intergraph personnel shall resolve the problem and the Reliability Test period will re-commence at the point where it was suspended. Upon receipt of a P2 software correction, the Customer has 24 hours to test the software correction and place it into production. If the Customer does not place the software correction into production within 24 hours, the Reliability Test period will resume. Once the system operates for a total of Thirty (30) calendar days without an Error Level 2, the Reliability test will be completed. If a P2 is identified during the last ten (10) days of the Reliability Test period, an additional fourteen (14) days will be added to the reliability period to evaluate the system software correction.

**Error Level 3 (P3)** — Non-critical errors that are defined as incomplete operation of system where a procedural workaround is readily available, and productive use of the system is not significantly impacted. In the event this type of error occurs, the Customer will immediately notify Intergraph, but the Reliability Test period will continue. If possible, Intergraph shall resolve the problem during the Reliability Test period, but if necessary, resolve in a future bug fixes release of the product.

**Error Level 4 (P4)** — Cosmetic errors that are defined as configuration issues that can be corrected by the Customer, data integrity issues that must be addressed by the Customer, help file documentation errors, or enhancements that can be made in the future to the presently released version.
7  **SYSTEM AVAILABILITY TEST**

During the 30-Day Reliability Test Period, the CAD Subsystem shall be available 99.999 percent of the time as measured by the criteria defined below. The RMS Subsystems shall be available 99.99 percent of the time.

The following criteria defines System Availability and the method by which it is calculated.

1. The System will be considered available for use only when each of the following conditions is met:
   a. Installed hardware and software have power applied and are operating correctly based on manufacturer specifications.
   b. All functions and interfaces necessary for the processing and management of calls for service and the management of resources are operating correctly per Product Specifications.
   c. All functions necessary for creating, editing or searching for a record maintained by the Systems are operating correctly.

2. System availability will be expressed as a percentage of the maximum expected availability over a given period. The System must be available 7 days per week, 24 hours per day.

3. Scheduled down time for System upgrades will not be construed as Hours System Unavailable.

4. The percentage availability for any period will be calculated as follows:

   \[
   \frac{(\text{Total Hours in Period} - \text{Hours System Unavailable}) \times 100}{\text{Total Hours in Period}}
   \]

If availability degradation is discovered, the Customer may choose to stop use of the application or use whatever operational portion may be available. The Customer, Intergraph and/or its Subcontractor(s) will determine a mutually acceptable error level and remedy as per Error Level P1 – P4 listed above.
# Maricopa County Data Evaluation Summary

## MCSO Service Area Only:

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Features Analyzed</th>
<th>Anomaly Count</th>
<th>Anomaly %</th>
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</thead>
<tbody>
<tr>
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<td>Attribution Errors</td>
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<td><strong>MSAG</strong></td>
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<tr>
<td>MSAG/Street Errors</td>
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<td>Street/MSAG Errors</td>
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<td><strong>MSAG 100 BLOCK</strong></td>
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*11,359 represent the total number of MSAG records and not blocks. There are 50,129 individual blocks for the MCSO Jurisdiction area.*

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Features Analyzed</th>
<th>Anomaly Count</th>
<th>Anomaly %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADDRESS POINTS</strong></td>
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<tr>
<td>Address Point Errors</td>
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<td><strong>TOPOLOGY</strong></td>
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<td>Topology Errors (entire county)</td>
<td>265,952</td>
<td>5,024</td>
<td>1.9%</td>
</tr>
</tbody>
</table>
Attachment H: Clarifications

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1 **PRICING CHANGES**

- **Hardware:**
  - Optioned all Hardware pricing as the County intends to purchase and install the hardware directly. Final pricing included a hardware refresh from HP to reflect current model availability.
  - Virtualized the remaining non-Oracle Database Servers/environments - adding/updating the Host Server hardware.
  - Revised workstation pricing to show workstations for the MCSO and APD Communications Center, MCSO CAD System Administrators and the CAD Test/Training Positions as HP Blade Workstations rather than Desktop workstations.
  - Added an additional SAN to the production environment (Optional Pricing) to support the virtual configuration as well as the relocation of the system after CAD/MPS cutover.

- **Software Licenses**
  - **Relabeled the following**
    - Interface / Communications Server #1: I/Informer Site Specific Development Services for Additional ACJIS Transactions to I/Informer Site Specific Development Services for XML to Clipboard Parsing
    - Interface / Communications Server #2: I/Informer to Interface F - Redundant License to I/Informer to Support for DMV images from the State - Redundant License
    - Interface / Communications Server #2: I/Informer to Interface G - Redundant License to I/Informer Nested Queries - Redundant License
  - **Reduced**
    - I/Push To Talk (IPS0008) from 2 licenses to 1 license on all environments. Assumes connection to one Radio Controller
    - I/NetViewer to 50 concurrent users on all environments
    - I/NetDispatcher to 5 concurrent users on all environments
    - I/Dispatcher licenses for MCSO Comm Center from 28 to 22 licenses. Probation / APD Comm Center units combined with MSCO Comm Center licenses.
    - I/Incident Analyst CC licenses (Qty 2) were removed as they were duplicates of the I/Incident Analyst w/GeoMedia and GeoMedia Grid bundle
    - inPURSUIT RMS Concurrent User Licences from 133 to 25 licenses.
- **Replaced**
  - The inPURSUIT COPLINK interface with inPURSUIT Standard COPLINK Interface
- **Added**
  - Ingr EdgeFrontier Platform. Added to support MQSeries for RMS Interfaces - Pre-Booking Portal and County Attorney Interface
  - Apache TomCat (Free Internet Download) to mirror configuration. No pricing impact.
  - inPURSUIT Ad-hoc Report Builder. Added due to a change in the Intergraph pricing policy. Note: No pricing impact as this was included as an additional discount
  - I/Dispatcher - Backup Licenses (Qty 15)
  - I/Dispatcher - Test License (Qty 15). Moved from Optional pricing to Base pricing.
  - Mobile for Public Safety - Test (Qty 15)
  - inPURSUIT Field Based Reporting Per Mobile Installed License- Test License (Qty 15)
  - inPURSUIT Records Management System Desktop Client - Test License (Qty 15)
  - inPURSUIT RMS Explorer - Test License (Qty 15)
  - Mobile for Public Safety - Concurrent Licenses. Increased from 83 licenses to 100 licenses.
  - inPURSUIT FBR Per Mobile Installed Licenses. Increased from 250 licenses to 300 licenses.
  - Site License Conversion Fee (Fee covers client licenses for I/Dispatcher, Mobile for Public Safety, inPursuit RMS, FBR, RMS Explorer, I/NetViewer and I/NetDispatcher only). Moved from Optional pricing to Base pricing.
  - Intergraph Business Intelligence (BI) for inPURSUIT RMS Software added to Base pricing (and SOW documents)
- **Optioned**
  - VMWare products (including vSphere, vCenter Server and Microsoft SQL Server 2008 R2 Express) based on discussions as the County intends to purchase and install the VMWare products.
  - inPURSUIT CAGIS - Per Client User Licenses. Three (3) of six (6) licenses were moved to Optional pricing.
  - SoftCode Civil Process software (Optioned in the Proposal BAFO pricing.)
- **Label-EZ for GeoMedia Pro NL.** Noted as an option in the Configuration Drawing in the Proposal but inadvertently left off of the optional pricing. This product has enhanced labeling capabilities above and beyond those native to GeoMedia Pro.

- **GeoLabel Pro for GeoMedia NL.** Added to Options for comparison purposes. This product has enhanced labeling capabilities above and beyond those native to GeoMedia Pro.

- **Other**
  - Mirrored all Interfaces on the Primary Production Server on the Redundant and Backup environments. No pricing impact to these changes.

- **Project Services**
  - **Revised**
    - CAD Data Analysis and Conversion. Original proposal was CAD Data Analysis only.
    - RMS Data Analysis and Conversion. Original proposal was RMS Data Analysis only.
  - **Optioned**
    - CAD and RMS Fit and Gap
    - Intergraph HW installation services
    - GDR Data Evaluation and Data Enhancement Services added to Optional pricing
    - SoftCode Civil Process services (Optioned in the Proposal BAFO pricing.)
  - **Added**
    - Intergraph Business Intelligence (BI) for inPURSUIT RMS Training and Implementation Services added to Base pricing
    - CAD Consulting Services - Production System Re-location Plan. These are services added to the CAD Implementation to support the County in planning for the movement of the CAD System from the old Comm Center to the new facility post system cutover.
  - **Relabeled**
    - RMS Configuration Training - priced per session (Max of 10 Students / 2 days) to RMS/FBR Configuration Training - priced per session (Max of 10 Students / 2 days)

- **Other**
  - **Removed**
    - Performance Bond
2 INFORMATIONAL DOCUMENTS

The following sample documents are provided as appendices to this document and are for informational purpose only. The documents are not intended to be contractually obligating.

- Appendix H-1: High Availability and Disaster Recovery Solutions for the I/CAD 9.2 Database
- Appendix H-2: HP Continuous Access EVA Whitepaper
- Appendix H-3: Map Data Requirements Summary v9.1
- Appendix H-4: CAD Map Data Requirements v9.1
- Appendix H-5: CAD Database Schema
- Appendix H-6: GDR SOW For Maricopa County Public Safety Geofile Evaluation
- Appendix H-7: GDR MCSO Preliminary GIS Data Evaluation
- Appendix H-8: GDR Maricopa County Data Evaluation Summary
- Appendix H-9: NENA Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI

3 REQUIREMENTS CLARIFICATIONS

The following sections outline clarifications related to the Maricopa County Requirements documented in the Request for Proposal for CAD/RMS/CIVIL PROCESS and MOBILE SYSTEMS, Serial 11086-RFP.

3.1 SOFTCODE CIVIL PROCESS SYSTEM

The SoftCode Civil Process System was moved from the Base pricing in Intergraph Corporation’s Response to Maricopa County’s Request for Proposal for CAD/RMS/CIVIL PROCESS and MOBILE SYSTEMS, Serial 11086-RFP to Optional pricing in the BAFO and final contract.

Unless SoftCode Civil Process is purchased as a Contract Change Order, these requirements, including those identified in Intergraph’s response to the Vendor Scoring tool, will not be considered as part of the Contract Requirements. These include the following RMS Requirement Line Items: 1237-1244, 1249, 1252, 1271, 1273, 1275-1310, 1312-1321, 1323-1344, 1346, 1347, 1349-1361, 1363-1365, 1367, 1368, 1370-1378, 1381-1392, 1395-1403, 1405, 1487-1543, 1545-1557.
3.2 RMS Pawn Module

Based on the review of RMS System Interface requirements, the County will transition from their current Pawn System to the inPURSUIT Pawn Module. Intergraph will provide a one-way import process from the area Pawn Shops within the County to the inPURSUIT RMS leveraging Web-Services as described in SOW Attachment D Interface Descriptions.

This is lieu of the timed, one-way push interface between the RMS system and Maricopa County’s Pawn System for the exchange of pawned and stolen property information as described in Maricopa County’s Request for Proposal for CAD/RMS/CIVIL PROCESS and MOBILE SYSTEMS, Serial 11086-RFP.

3.3 RMS Property and Evidence Module

The County has directed that they intend to continue using their Property and Evidence module and will not convert Property and Evidence data into inPURSUIT as originally described in the RFP. The RMS Property and Evidence requirements, including those identified in Intergraph’s response to the Vendor Scoring tool, will not be considered as part of the Contract Requirements.

The associated functional requirements that are dependent on RMS Property and Evidence include the following RMS Requirement Line Items: 727 – 781 which equate to Requirements 18.1 through 18.44.

4 Site License Explanation

Intergraph understands the County will be procuring the Intergraph Site Licenses as per the description below. A Site License Conversion Fee is included in the Contract pricing. This fee covers client licenses for I/Dispatcher, Mobile for Public Safety, inPursuit RMS, FBR, RMS Explorer, I/NetViewer and I/NetDispatcher only. The site license does not apply to any Software Package for which Contractor would owe a third-party royalty, any third-party software furnished to the County by Contractor, or any other Software Package not specifically identified in the Agreement as a site license. No other use is licensed.

Intergraph’s site licenses allow the County to purchase the licenses needed by the agencies named to use the specific software packages and to use an unlimited number of license quantities as needed without an additional software license purchase fee while the products and site license remain under maintenance contract with Intergraph. Intergraph has provided this site license pricing based on agency provided information related to the current number of users. As the County’s procurement process provides further clarity on these counts, Intergraph may need to adjust its site license pricing to accommodate these changes in base user counts.
Site licenses are valid for use by the named agencies or entities as noted in this agreement (See list below). Should the County add other agencies to the system beyond those noted, additional licenses must be purchased for the immediate need and a site license uplift will be applied to those additional licenses.

- Maricopa County Sheriff’s Office (MCSO)
- Maricopa County Adult Probation Office

Maintenance costs for licenses will be adjusted to match actual sustained usage after five years of production use of the system (after cutover). Intergraph will audit the actual sustained usage levels at the end of the first five-year period (including extended warranty) and will readjust the maintenance cost upward if the license count increases. At no time will Intergraph charge the County a license fee for any additional licenses utilized, unless additional licenses are as a result of added named agencies or entities as noted above, nor reduce maintenance cost if there is a reduction in actual licenses used. The only incremental costs to the County, beginning in year five of the maintenance period, is the additional maintenance cost associated with the additional licenses (if any). Intergraph will audit the account and adjust the maintenance charges, if sustained usage has increased, every three years following the initial audit period.

5 STATE AND FEDERAL MANDATED CHANGES

If a customer is paying maintenance for a State or Federal specific product (I/Informer interface to NCIC, citation, State mandated reports or reporting capability, which includes accident and crash reports, UCR, and NIBRS), there are no software license or development charges for these State or Federal specific products when upgrading a customer to a new Intergraph I/CAD or inPURSUIT product version. This excludes services for installation, upgrades, fixes, programming or software development as well as upgrades, updates fixes and enhancements which are related to any third party software or systems. Customers will receive the existing standard State or Federal specific functionality for that product.

If the customer does not have the technical expertise required to install the Intergraph product or requires customization or enhancements beyond standard functionality, they must purchase implementation and/or customization services.

If a customer is not paying maintenance for a State or Federal specific product, the customer must purchase the back maintenance on the appropriate licenses and any required customization services.

I/Informer enhancements for a new State protocol will be delivered on the current or previous (N-1) version of I/CAD and inPURSUIT. The customer may incur additional costs to bring I/CAD, inPURSUIT or other required products up to an acceptable version level.

New State or Federal Mandated requirements, such as a mandated message switch protocol upgrade or modification, new transactions, or functionality that the State or Federal agency has
added, are not covered under product maintenance and will require additional cost to support. The customer may be required to provide a test environment depending on the nature of the state mandated change. The customer will be required to pay for custom work to address State or Federal mandated protocol, data transfer, citation or reporting changes which are not supported by the current release of an Intergraph I/CAD or inPURSUIT product.

The customer is responsible for providing a complete and accurate description of the new State or Federal mandated requirements. The customer is responsible for any software/hardware required to implement the new requirements, except for those products which are specifically covered under Intergraph maintenance agreements. The customer is responsible for any costs associated with a formal certification of the products (if required).

Intergraph must have a minimum of 180 days lead-time before the State or Federal mandated changes take effect. Depending upon the nature of the new State or Federal mandated requirements, the delivery of these changes may require that it be in coordination with the next major Intergraph I/CAD or inPURSUIT product version release.

6 SYSTEM ARCHITECTURE DISCUSSION

The County indicated that it is their preference to virtualize all environments including both Server and Client environments provided virtualization is supported / recommended by Intergraph for those environments. Virtualization of the Server environments is supported as described below. Virtualization of the Client environments, using a software application such as VMWare View, is not supported as described below.

6.1 VIRTUALIZATION OF SERVER ENVIRONMENTS

Intergraph has revised the MCSO CAD/MPS/RMS/FBR System Configuration Drawing (SOW Attachment C – Configuration Drawing) to reflect the Virtual Server Environments identified in the list below.

Virtualization is supported on these servers provided the County’s I/CAD System is configured and maintained according to Intergraph recommendations for workstation, system and application configuration, as well as for database maintenance. See SOW Attachment F – Public Safety System Specifications.

Specifically:

- I/CAD servers, with the exception of our IIF/BizTalk server, has been certified to run in a virtual environment with VMware vSphere 4, provided the dedicated resources meet or exceed the hardware CPU, memory, and disk space requirements detailed Attachment F.
For I/CAD Communication / Interface servers (including Mobile Computer System servers), virtualizing the interface/communication server is supported. If there are any serial RS232 interfaces on the Communication / Interface server, then a serial-to-IP conversion device at the host level will be required since a virtualized interface server has no RS232 port. For a Serial-over-IP device Intergraph recommends the Digi PortServer® TS serial server.

inPURSUIT RMS Servers are considered Viable in a virtual Environment. Licensing of the Windows Server OS, SQL Server, and especially Oracle have unique licensing requirements under VMware. Use of Oracle with VMware is typically very expensive to license and often makes that configuration cost prohibitive to implement.

The **MCSO CAD/MPS/RMS/FBR Production Virtualized Environment** includes the following servers:

- **Host Server #1:**
  - I/CAD Database Server #1
  - Communications/Interface Server #1
  - Mobile Computer System Server #1

- **Host Server #2:**
  - Communications/Interface Server #2
  - Mobile Computer System Server #2
  - I/NetViewer/I/NetDispatcher/Archive/Report Server
  - vCenter Server (Optioned)

- **Host Server #3:**
  - I/CAD Database Server #2
  - I/CAD Test/Training Server
  - Test/Training Communications/Interface Server
  - Orion Communications Application/Database Server (Optioned)

- **Host Server #4:**
  - inPURSUIT FBR Server
  - inPURSUIT Interface/Report Server
  - inPURSUIT RMS Explorer Server
  - SoftCode Civil Process Server (Optioned)
- **Host Server #5:**
  - Business Intelligence (BI) Application Server
  - Business Intelligence (BI) ETL Service Server
  - Business Intelligence (BI) Database Server
  - SoftCode Civil Process Test/Training Server (Optioned)

The **MCSO CAD Backup/Disaster Recovery Virtualized Environment** includes the following Servers:
- **Backup Host Server**
  - I/CAD Backup Database Server
  - Backup Communications/Interface Server
  - Backup Mobile Computer System Server

**Note:** Virtualization is not supported, or may be cost prohibitive, on the following servers:

The **MCSO CAD/MPS/RMS/FBR Production Physical Environment** includes the following Servers:
- **inPURSUIT RMS Physical Environment:**
  - inPURSUIT RMS Server #1
  - inPURSUIT RMS Server #2
  - inPURSUIT Test/Training Server

- **Interoperability Framework (IIF) / Biztalk Physical Environment (Optioned):**
  - Interoperability Framework (IIF) / BizTalk Server (Non-High Availability)
  - Interoperability Framework (IIF) / BizTalk Server (High Availability – Qty 4)

### 6.2 Virtualization of Client Environments

Intergraph has revised the MCSO CAD/MPS/RMS/FBR System Configuration Drawing to reflect Workstations for the MCSO Communications Center, APD Communications Center, MCSO CAD System Administrators and the CAD Test/Training Positions as HP Blade Workstations rather than Desktop workstations. The remaining clients are shown as desktop workstations (e.g. Mapping, RMS Desktop Clients, I/NetDispatcher, etc.) or laptops (e.g. MPS, inPURSUIT FBR).
Running Intergraph clients on a HP Blade workstation is a **Viable** configuration provided that the blade workstations are configured and maintained according to Intergraph recommendations for workstation, system and application configuration (See Attachment F – Public Safety System Specifications) and installed and configured according to the HP manufacturer recommendations.

Intergraph’s definition of a **Viable** platform is:

> The particular platform has **not** been tested by Intergraph, however the technology is similar enough to one of the Certified platforms that compatibility is practical. Although we expect our applications to be compatible with Viable platforms, **contractual performance or high availability requirements cannot be guaranteed**.

Virtualization of Intergraph CAD and RMS clients, using a product such as VMWare View, is **NOT** an Intergraph certified environment. There are currently no plans to certify Intergraph Public Safety clients with software virtualization. Virtualization for client applications is currently **NOT** considered a **Viable** platform. Intergraph has concerns about performance, particularly graphics performance, for an I/CAD system and ensuring that it will meet the performance and availability needs of a mission-critical, 24x7 public safety system.

Please see Attachment I – Customer Support Center for a complete definition of Intergraph SG&I Compatibility requirements including definitions for **Certified, Viable and Not Viable** platforms.

### 7 RELOCATION OF THE COUNTY’S INTERGRAPH PUBLIC SAFETY SYSTEM

In parallel with the Intergraph CAD/MPS/RMS/FBR project implementation, the County will be constructing a new facility which will house the Public Safety Computer System as well as the MCSO Communications Center. The County intends to cutover their Intergraph CAD/MPS system to production in the existing building / communications and then move the system and users to the new facility approximately one month later. Intergraph has included additional CAD project services to assist the County Management and IT Staff in planning the CAD / MPS system move.

Note: Intergraph assumes that the County will actually perform the relocation of the systems. Additional services can be quoted upon request, should the customer require Intergraph services to support the actual relocation.

Note: The current project schedule assumes that the relocation of the Intergraph CAD/MPS/RMS/FBR system to the new facility will occur **BEFORE** cutover of the RMS/FBR system to production therefore additional RMS/FBR project services have not been included.
8 DATA CONVERSION

8.1 CAD DATA CONVERSION

Intergraph has altered the contract pricing to include a CAD Data Conversion in addition to a CAD Data Conversion Analysis.

Intergraph will convert up to 10 years of MCSO’s legacy PCR CAD data. The legacy PCR data will be provided in a single data source, a SQL Server database.

As a result of Intergraph’s CAD data conversion process described in the SOW, the converted CAD Data will be loaded into the Archive/Report/Web Server database. Standard I/CAD System queries and reports can successfully extract the data from the Archive/Report/Web Server. This approach/configuration is intended to maximize and “protect” the production server performance.

Please note the difference in migrating “dynamic” data and “static” data. The legacy CAD data to be converted includes “dynamic” data and includes incident information. Intergraph generally does not convert location and hazard info.

“Static” data is migrated as part of the project implementation process. Intergraph does not include migrating “static” non-historical CAD data from the legacy CAD into the Intergraph I/CAD system as part of a CAD Data Conversion effort. This is a separate but related effort from converting historical event / incident data. Static CAD data conversion is performed as part of the project implementation and includes such static data as Agency ID, Station Definitions, Personnel Definitions, Unit Types, Unit Definitions, Vehicle Definitions, Event Type Codes, Out of Service Codes, Disposition Codes, Special Address, etc.

8.2 RMS DATA CONVERSION

Intergraph has altered the contract pricing to include an RMS Data Conversion in addition to an RMS Data Conversion Analysis. Using Intergraph’s RMS data conversion process described in the SOW, the following types / sources of information will be converted.

- RMS Data – master entities, code lists, etc.
- Pawn Data
- Case Data
- Internal Affairs Data
- UCR Data
- Personnel Data
- Field Interview Data
- Attachments (Word and JPEG formats)
Note: the data conversion pricing does not include the conversion of mugshot images. Conversion of mugshot images was determined not to be viable.

The Intergraph pricing is based on the following assumptions:

- The Customer is responsible for exporting data from each legacy system and providing the data in an ODBC compliant database format.

- The County will extract the various data sources into a single data source type (such as tables in SQL Server) and cleanse that information. Intergraph’s price does not include “data cleansing” services.

- Intergraph will migrate data elements for which there is an existing target field in the RMS database. Intergraph’s price does not include the addition of new fields to the database or to the system’s GUI.

9 GDR GIS DATA EVALUATION AND ENHANCEMENT SERVICES

GIS Data Evaluation: GIS Data Resources, Inc. (GDR) provided a statement of work (SOW) for a Maricopa County Public Safety Geofile Evaluation (see Appendix H-6: GDR SOW For Maricopa County Public Safety Geofile Evaluation). The associated pricing was included in the contract quotation as Optional pricing. Should the County purchase the GDR Data Evaluation, Intergraph and the County would execute a formal SOW and Contract Change Order.

GIS Data Enhancement: Using map / GIS data provided by Maricopa County, GDR conducted a preliminary data evaluation. See Appendix H-7: GDR MCSO Preliminary GIS Data Evaluation and Appendix H-8: GDR Maricopa County Data Evaluation Summary for the results of that evaluation. The associated budgetary estimate is included in the contract quotation as Optional pricing. See also Appendix H-9: NENA Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI

If the Maricopa County Public Safety Geofile Evaluation (described in the paragraph above) is purchased, GDR will provide a formal cost proposal and SOW for the GIS Data Enhancement to provide the services necessary for the County to achieve its accuracy and completeness goals consistent with NENA guidelines and the desired services from the County. Should the County purchase the GDR Data Enhancement, Intergraph and the County would execute a formal SOW and Contract Change Order.
SOW Attachment I: Customer Support Center

Intergraph is committed to ensuring that the procedures are in place and available to provide maximum service delivery to our customers. As part of the ongoing, post-cutover support available to our customers through the Reliability Test Period, Intergraph Warranty and the Intergraph Maintenance Program, Intergraph provides several core infrastructures:

- Intergraph Customer Support Center
- Intergraph Software Upgrades
- Intergraph On-site Resident Engineers (if purchased)
- Intergraph Customer-specific On-site Support (if purchased)

The Intergraph Customer Support Center and Services Provided

The Intergraph Customer Support Center is an integral part of the Warranty and Maintenance programs and is provided at no additional cost. As part of the standard support infrastructure available to our customers, outside of any resident or on-site support program that may be purchased and implemented, the Customer Support Center provides the following:

- Toll-free access to the Intergraph Customer Support Center resources
- “Always-available” support during the time period covered by Warranty and Maintenance programs.
- Monitored response times by priority
- A central single point-of-contact for all problems
- First level of direct support for all products purchased from Intergraph, including Intergraph software applications, third-party software/hardware, operating system software, database management system, development tools, report writers, productivity tools, networking software, and external interface software
- Problem resolution based on priority level

The main priority of the Intergraph Customer Support Center is to meet the needs of the customer when problems occur and assist in keeping the system in operation and running smoothly. The Customer Support Center works problems in a priority order and the more information that can be provided when a problem is reported; the quicker a solution can be found. For the Customer Support Center to be able to expeditiously resolve problems, it is important that the customer’s System Administrator attempts to isolate the nature of the problem and determine if it is a hardware or software issue. It is also important that circumstances under which the problem occurs are thoroughly documented prior to reporting the problem.

When reporting an issue to Intergraph Customer Support, the customer initially determines the priority level of the problem and, in working with the Customer Support Center representative(s), mutual agreement may result in the priority level being raised or lowered depending on the findings during problem investigation. The Customer Support Center has established the following priority levels for reported problems:
## Customer Support Center Priority Levels, Response Times, and Resolution Targets

<table>
<thead>
<tr>
<th>Priority</th>
<th>Problem Description</th>
<th>Response Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level One</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Loss of data  
- Data corruption  
- Productive use prohibited  
- No workaround available  
- Aborts  | M-F, 7:00AM-7:00PM Central Time  
- Immediate* or within 30 minutes of notification  |  
- 12 hours – Program code correction or a procedural workaround |
| **Level Two** |  
- Primary purpose compromised  
- Productive use significantly impacted  
- Workaround generally not available  | M-F, 7:00AM-7:00PM Central Time  
- Immediate* or within one hour of notification during normal business hours  |  
- 48 hours – Program code correction or a procedural workaround |
| **Level Three** |  
- Productive, but incomplete operation  
- Workarounds generally available  | M-F, 7:00AM-7:00PM Central Time  
- Immediate* or within eight hours of notification during normal business hours  |  
- One week – Procedural workaround  
- Program code correction in a future software release |
| **Level Four** |  
- Productive, mainly cosmetic in nature  
- Workarounds or configurable options generally available  | M-F, 7:00AM-7:00PM Central Time  
- Immediate* or within eight hours of notification during normal business hours  |  
- One week – Procedural workaround  
- Program code correction in a future software release |

* Immediate - Without need to call back in most cases

Priority Level One and Two problems that have no discernible workaround are escalated when appropriate to Intergraph Customer Support Management who will participate in the decision-making and resolution process.

The Customer Support Center personnel are available 24 x 7 x 365 via a single toll-free phone number. Between the hours of 7:00 a.m. and 7:00 p.m. CDT, Monday through Friday the calls are answered immediately by the Call Center staff. All after-hours, critical calls are routed to on-call personnel through an automated message system and answered within 30 minutes of receipt, ensuring customers will have help available when needed. Regardless of the problem or the time of day, customers can reach Intergraph customer support through a single phone number.

In addition to telephone support, Intergraph offers electronic access to the Customer Support Center via the Intergraph Customer web site. Intergraph eService allows our customers to:

- Report a new issue
- Update or monitor an outstanding issue
- Report on issues previously reported
- Search the confirmed issues previously reported by other customers
- Search the Intergraph knowledge base
- Review Release Notes for products available to customers
- Review plans for upcoming releases
- Review Certified Environment information about the products available or those products which will be made available in the next 90 days.

The following table provides a list of possible actions that may be taken by Customer Support Center personnel to provide problem resolution:
If Intergraph determines that...

- Local Intergraph personnel must be involved
- On-site software support is necessary

Then the Customer Support Representative will...

- Initiate involvement of those specialists
- Initiate the request for on-site software support personnel

For many problems, support personnel can access the customer’s system via VPN and quickly isolate, if not resolve, the problem. Intergraph system configurations can be accessed via VPN, allowing Intergraph personnel to connect into systems to perform remote diagnosis, verification, and correction of system problems. Remote access to the customer’s system via VPN is completely under the security controls imposed by the customer. Intergraph agrees to work within the customer’s security framework for all system access.

SecureLink Virtual Support Network

In a continuing effort to deliver more effective customer service, Intergraph has chosen to standardize on SecureLink Virtual Support Network for remote customer connectivity. SecureLink is used by over 11,000 security conscious organizations serving high security markets including health care, government, public sector, legal, university, and financial institutions. SecureLink enables Intergraph to deliver faster, more secure and efficient support while providing superior security, audit, and control to our customers; thus enabling security and audit compliance with industry standards such as CJIS, FIPS, SOx, HIPAA and G-L-B.

How does SecureLink benefit our customers?

In addition to the efficiencies gained by Intergraph’s support and services organizations, there are numerous benefits for our customers as well.

Key benefits for Intergraph’s customers using SecureLink include:

- Full control over access rules including anytime, scheduled or request-only settings
- Secure, fully encrypted communications between Intergraph and your network
- Configurable, real-time email notifications when Intergraph establishes a remote access session
- Control over all server or workstation ports/services that are available for use
- No expense is incurred for this SecureLink service for Intergraph customers on maintenance
- Identification of each individual analyst including audit trails recording the time, servers and services accessed on your network.
- Faster access for Intergraph analysts means faster times-to-resolution for our customers

SecureLink is a solution designed specifically for the purpose of enabling enterprise technology companies to provide secure, auditable and efficient remote support and services to our security-conscious customers. SecureLink operates from a dedicated server located within Intergraph’s secure network. A small client application called a “Gatekeeper” is then downloaded from the Intergraph SecureLink server and installed on servers or workstations that require remote connectivity.

The Gatekeeper installation is a simple 2-click process. No further work or configuration is normally required. The Gatekeeper is then in direct communication with the Intergraph SecureLink server and available for remote connectivity by an analyst. All communications are established by your Gatekeeper to Intergraph’s SecureLink server. The Gatekeeper sends a tiny outbound “ping” every 2 minutes to check in with the SecureLink server to see if an analyst is requesting access. When an analyst requests access, a secure, fully encrypted SSH tunnel is created.
with 128-bit AES encryption by default. Once the tunnel is established the Gatekeeper forwards the available ports on your server (usually RDP, FTP and a command-prompt) to the Intergraph analyst to support your systems.

Ultimately, you have full control over the settings and rules within your Gatekeeper. The standard Gatekeeper does come pre-configured with all the standard settings we require to get started. Intergraph analysts will typically require the RDP and FTP services to be enabled within your Gatekeeper(s), and we strongly encourage customers to setup email notifications.

For more information, you can visit the following Intergraph's SecureLink site which includes several answers to frequently asked questions as well as a flash demo describing how the SecureLink technology works:

http://securelink.intergraph.com/moreinfo.vm

To get started with Intergraph’s SecureLink technology or if you have any other questions, please email the Intergraph SecureLink team at: securelink@intergraph.com

**INTERGRAPH SOFTWARE UPGRADES**

Intergraph provides two types of software releases: Major and Minor. A Major release is made available to customers approximately every 12 to 18 months and includes significant product enhancements and improvements. Major features releases may result in structural changes to the database management system schema. Minor releases are minor incremental releases of the software that contain a limited number of minor enhancements as well as corrections for problems that have been found internally or reported by customers. Minor releases generally occur three to four times per year and typically do not contain structural changes to the database management system schema. Minor releases are planned and scheduled for the most current version (n) and the previous version (n-1). Minor releases for versions n-2 and earlier versions are not available. Intergraph encourages our customers to stay current within two releases of the most current supported version of software (version “n” or “n-1”). By staying current, customers avoid encountering issues that have been reported by others. All Intergraph software releases have to pass a stringent quality assurance testing process before being released for customer use.

Occasionally, a customer requires a code change to address a critical P1 or P2 issue on their current release (n or n-1 version) and they cannot wait for the next scheduled base product Minor update release. In these cases, a software patch is created for the particular product on the customer’s current n or n-1 version release. When software patches are supplied to the Customer, Intergraph will supply technical instructions on how to install and verify the patch. As with Minor releases, software patches are only available for the most current version (n) and the previous version (n-1).

During initial project kick-off Intergraph and the Customer teams will mutually agree upon which version of software will be implemented.

Examples of the numbering scheme for Major releases, Minor releases, and software patches are as follows:

- Major releases: 9.0.x, 9.1.x, 9.2.x
- Minor releases: 9.0.0, 9.0.1, 9.0.2
- Patches (by product build #): I/Dispatcher_9.0.1.32, I/Dispatcher_9.0.1.33
INTERGRAPH-SG&I COMPATIBILITY REQUIREMENTS

Intergraph-SG&I product lines are developed with certain compatibility requirements. These requirements identify the intended operating environment for our software. This environment includes third party technologies like operating systems, database software, virtualization platforms, interface products, network configurations, hardware, and versions of standard desktop tools like Internet Explorer. Intergraph-SG&I cannot certify its software against all possible platform combinations, for that reason the following information clarifies our support policy for **Certified, Viable, and Not Viable** configurations.

- **Certified** – The particular platform (i.e., 3rd party operating systems, database software, virtualization platforms, interface products, network configurations, hardware, and/or desktop software) has been tested as a standard scenario in SG&I’s Development and Quality Assurance cycles. For a list of Certified platforms, please see the “Certified Environments” matrix as available by product on the Intergraph-SG&I Customer Support web: http://support.intergraph.com/

- **Viable** – The particular platform has not been tested, however the technology is similar enough to one of the Certified platforms that compatibility is practical. Although we expect our applications to be compatible with Viable platforms, contractual performance or high availability requirements cannot be guaranteed.

- **Not Viable** - The particular platform is known to have limits with Intergraph-SG&I software and/or is not similar to any Certified configuration covered in our standard test environment.

From a Customer Support viewpoint, Intergraph-SG&I will accept and actively work all application support calls for **Certified** and **Viable** platforms. If Intergraph cannot reproduce the issue on a Certified platform and we determine that the problem is directly related to the Viable platform configuration, Intergraph reserves the right to request that the customer submit a services change order to resolve the issue or as another option, request that the customer implement our applications on a Certified platform. For customers running our applications on virtualized platforms, Intergraph-SG&I support will presume that any logged problem is common to both standard hardware and virtual configurations. However if we believe the issue is directly related to the virtualization platform, Intergraph-SG&I reserves the right to request that customers recreate the problem with the virtualized platform removed. Intergraph-SG&I does not provide support or fixes for **Not Viable** platforms.
High Availability and Disaster Recovery Solutions for the Intergraph CAD 9.2 Database:

SQL Server Database Mirroring and Oracle Data Guard

Revision B
Last Updated: October 25, 2011
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**Introduction**

Intergraph’s CAD systems provide critical incident management services to millions of people around the world. Police, fire, and ambulance services, as well as transportation systems and military installations, rely on Intergraph’s systems 24 hours a day, 7 days a week. Intergraph’s CAD systems must continue to run despite hardware or software problems on the primary database server. This is called *high availability*. In addition, these systems often must continue to run at a backup site if the main center becomes unavailable. This is called *disaster recovery*.

In the mid-1990s, Intergraph developed its own database high availability and disaster recovery solution because there were no viable alternatives. Intergraph's solution used Redundant ADO (RADO), a client-side library that wrote to two databases. Intergraph’s solution supported two database servers located at the main site and one off-site database server maintained by DBCopy. If the primary database failed, a process called DBStat declared the primary database down, and client applications such as I/Dispatcher seamlessly failed over to the secondary. When the problem with the primary was resolved, a system administrator ran Intergraph's DBRecover application to restore dual database processing.

Intergraph supports two high availability and disaster recovery options from the database vendors: Oracle Data Guard and SQL Server Database Mirroring. Oracle Data Guard and SQL Server Database Mirroring provide a server-based mechanism of maintaining a hot standby database, automatic failover if the primary database fails, and automatic resynchronization of the former primary after a failover. Intergraph introduced support for Oracle Data Guard in CAD 8.0.2 and support for SQL Server Database Mirroring in CAD 8.1.0. Intergraph enhanced its support for SQL Server Database Mirroring by introducing support for one or two log shipping databases in CAD 8.1.2. CAD 9.0 added support for Oracle 11gR1 and SQL Server 2008. CAD 9.1 introduced support for Oracle 11gR2, which supports Windows 7 and Windows Server 2008 R2. CAD 9.2 supports SQL Server 2008 R2.

The message communicated at the Intergraph 2009 User Group conference was Intergraph’s RADO/DBRecover high availability solution would no longer be delivered starting with the next major release after CAD version 9.1. Indeed, starting with CAD 9.2, Intergraph’s proprietary solution is no longer supported. Therefore, new system implementations are being proposed with either a SQL Server Database Mirroring or an Oracle Data Guard solution for high availability. Note that Oracle Data Guard requires Oracle Enterprise Edition.

This document describes the high availability and disaster recovery options for Intergraph CAD systems: SQL Server Database Mirroring and Oracle Data Guard. Please note that more information is available in Intergraph’s CAD System Administrator Help, as well as from Oracle and Microsoft. Try searching for “Oracle Data Guard” or “SQL Server Database Mirroring” in your favorite Internet search engine.
Role of Existing CAD Components in Data Guard and Database Mirroring Solutions

Intergraph’s DBRecover and DBStat products were retired in CAD 9.2.

Intergraph’s RADO library, which supported maintaining the two databases in a RADO/DBRecover system, no longer exists. The RADO library was transformed into the CADDAC (CAD Data Access layer) library. CADDAC only supports DB Vendor HA solutions.

Intergraph’s DBCopy application, delivered in I/Backup, is still used in Data Guard and Database Mirroring systems to maintain an archive database. As in the RADO/DBRecover system, you can use this archive database for reporting, but it will be 5-10 minutes behind the primary. If you require a reporting database that is more closely synchronized with the primary, you can use a logical standby in a Data Guard system or a subscriber maintained by transactional replication in a Database Mirroring system. DBCopy is also used to purge old data from the production CAD database, in order to maintain a performant system.
SQL Server Database Mirroring Solution

Microsoft introduced Database Mirroring in SQL Server 2005. Database Mirroring is a feature in both the Standard and Enterprise Editions of SQL Server. More information regarding Standard and Enterprise Edition is provided in the topic “Comparison of SQL Server Standard Edition and Enterprise Editions.” Database Mirroring provides a real-time hot backup (or “mirror”) of the primary database. With Database Mirroring, the primary (or “principal” in SQL Server terms) database ships transaction log data to one mirror database. This mechanism is described in more detail later. The primary communicates with the mirror using TCP/IP, so the databases must be able to communicate with each other over a network. Client applications read and write the primary database. Since the principal and mirror communicate synchronously, every time the application issues a commit, the application must wait for the commit to occur on the principal and mirror, Therefore, network slowdowns between the principal and mirror, or performance problems on the mirror can slowdown client applications.

Database Mirroring only supports one mirror, so you can only guarantee zero data loss when you failover to the synchronous mirror database. SQL Server provides another facility, called log shipping, which can be used to create asynchronous standbys. By adding log shipping, you can have the mirrored pair at the main site and a log shipping standby at a backup site Intergraph recommends placing the synchronous mirrored pair at one site, and putting an asynchronous log shipping standby at the backup site, if a backup site is required. Note that it is relatively easy to switch which database is acting as the mirror. In other words, you can start out with one configuration and then change it later. Indeed, for planned failovers to a backup site, Intergraph recommends temporarily converting the log shipping database into the mirror database, so that you can perform a seamless, zero down time, zero data loss failover to the database at the backup site, and a seamless failback to the main site. In the case of an unplanned failover to a log shipping database, there will be a small amount of data loss.

Log shipping relies on three jobs. The SQL Server Management Studio user interface supports scheduling each job as often as every 10 seconds. By scheduling the log shipping jobs every 10-15 seconds, you may be able to keep the log shipping database within about 1 minute of the primary database. The latency of the log shipping database may vary, depending on factors such as your log generation rate, network configuration, and server hardware.

SQL Server does not have direct support for client applications to failover to a log shipping standby. In CAD version 8.1.2, Intergraph added support for two log shipping databases, including support for client failover. Intergraph enhanced the connection algorithm to understand how to connect to any of 4 databases: the primary, the mirror and the two log shipping standbys. Therefore, failovers to a log shipping database do not require changes to the clients’ database configuration information.
You cannot read from the mirrored database directly. If you want a real-time reporting database, you can use transactional replication. Transactional replication uses a Publish-Subscribe metaphor: the current primary publishes data to the Distributor, and the Distributor distributes the data to the Subscriber(s).

Although SQL Server supports using both database mirroring and failover clustering, Intergraph does not support failover clustering for the production I/CAD databases.

This information is valid for Database Mirroring in SQL Server 2008 R2. In SQL Server 2008, Microsoft introduced enhancements to Database Mirroring, including: automatic bad page repair, log stream compression, performance enhancements and features to help administrators support and troubleshoot Database Mirroring.
Database Mirroring Configurations

SQL Server’s Database Mirroring only supports one mirror, but you can use one or two log shipping databases for asynchronous warm standbys. Intergraph recommends placing the mirror at the same site as the principal. The following diagram shows placing the witness and the principal, mirror, reporting and archive databases at the main site (Site 1), and placing the log shipping database across the WAN at the backup site (Site 2). The backup site may also have workstations and other backup servers, such as a backup communication server for the Intergraph Interface applications. Optionally, you can place a second log shipping database at the main site, at the backup site, or at another site.

Figure 2. SQL Server Database Mirroring Configuration

In this diagram, the workstations read and write the principal database. The principal is synchronously sending transaction log data to the mirror database. If a failover occurs, Intergraph software automatically connects to the new principal and continues operating. The witness forms a quorum with the principal and mirror databases. In SQL Server terms, you are running in “High Safety Mode with Automatic Failover.” Intergraph does not support running Database Mirroring in the other two modes, namely High Performance Mode (asynchronous) or High Safety Mode without a witness.

You can use DBCopy to maintain an archive database. As shown in the diagram, DBCopy will read data from the principal database and copy the data to the archive database. An archive database is used to store historical data and may contain many years worth of data; in contrast, the production database is typically purged regularly so that it
contains less data and therefore runs faster. An archive database maintained by DBCopy can be used for reporting, but the data will be 5 – 10 minutes old.

If you want a real-time reporting database, you can use transactional replication. As shown in the diagram, replication will pull data from the principal and copy the changes to the distributor and then to the subscriber. In transactional replication terms, the current principal will be the Publisher. The Distributor and Subscriber are on the reporting server. A real-time reporting database maintained by transactional replication can be within seconds of the primary.
Overview of How Database Mirroring Works

Whenever a change is made to data in a SQL Server database, SQL Server records the change in the transaction log. In SQL Server, the transaction log is at the database level. (By contrast, Oracle’s redo logs are at the instance level.) When a database is mirrored, SQL Server constantly sends the transaction log data to the mirror, and the mirror applies the changes. The data can be sent either synchronously or asynchronously. With synchronous communication, every time an application calls commit, the principal waits for acknowledgement that the data has been written to disk on the mirror before it returns control back to the calling application. Synchronous communication is required for Database Mirroring’s “High Safety Mode with Automatic Failover,” which is the only mode that Intergraph supports.

Starting in SQL Server 2008, the transaction log data is compressed before being transmitted from the principal to the mirror. The compression is automatic, and occurs in Standard and Enterprise Edition. Compression should reduce the network bandwidth requirements for mirroring, potentially improving throughput. Compression does require additional CPU resources on the principal and mirror.

Viewing Database Mirroring Information

In SQL Server Management Studio, the Database Properties dialog for the primary database has a Mirroring page.
This example shows that qadb92a is the principal, qadb92b is the mirror, and mojo is the witness. The operating mode is “High safety with automatic failover.” This should be the operating mode shown on your configuration. The status shows that the databases are fully synchronized. You can click the Failover button to initiate a manual failover to the mirror.

In addition, SQL Server provides the Database Mirroring Monitor. The monitor shows performance information and allows you to set up alerts if certain performance criteria are not met.
**Database Mirroring Failovers and the Role of the Witness**

SQL Server Database Mirroring supports manual and automatic failovers. You can perform a manual failover using the graphical user interface in Management Studio or by using an SQL command.

The witness forms a quorum with the primary and mirror. The job of the witness is to answer the question: “Who can you see?” If the witness and the primary can communicate, but the clients can only see the mirror, then no failover will occur. In other words, the decision to failover is made entirely by the witness and the mirror (unlike Intergraph’s traditional RADO/DBRecover system where the clients could request a failover). If the mirror and witness determine that there is a problem with the primary, then an automatic failover will occur. Since all failures cannot be directly detected, Database Mirroring has a timeout mechanism. By default, the timeout is 10 seconds. If the mirror and witness lose communication with the primary for 10 seconds, they will initiate a failover.

The witness forms a quorum with the principal and the mirror in order to prevent the “split-brain problem.” The “split brain” problem occurs when the system is split, say by a networking outage, and both the primary and secondary start acting as the primary and accepting changes from the applications. This leads to two independent databases (or two independent “brains”), with different data. Reconciling the data from these independent databases is extremely difficult. As part of preventing the split brain problem, if the principal cannot communicate with the witness or the mirror, then the principal will refuse new connections. The witness runs on an instance of SQL Server. You can use
Microsoft’s free SQL Server Express Edition to run the witness. You need to carefully decide where to place the witness because the place of the witness in your network topology will influence if and when an automatic failover will occur.

**Resynchronization of the Old Primary After a Failover**

Typically, there is no manual intervention required to resynchronize the old principal after a failover. Once the principal and the mirror re-establish contact, SQL Server automatically resynchronizes the old principal (the new mirror). For more information on the resynchronization process, please see Microsoft’s documentation.

**Impact of Failovers on Intergraph Applications**

When a failover occurs, SQL Server simply disconnects all the sessions on the primary. (SQL Server has no equivalent to Oracle’s Transparent Application Failover mechanism.) Intergraph has built failover handling logic into the CADDAC library to provide seamless failover handling. CADDAC detects the failover, reconnects to the database, and re-issues any in-progress commands. Therefore, a failover should only cause a slight pause in the application while the failover occurs. You will not need to key in data again or to click a button again.

**Performing Maintenance Tasks in a Database Mirroring System**

In a Database Mirroring system, there are two SQL Server instances on two database servers, but there is just one physical database. The principal and mirror database are exact copies maintained by the database servers. This is different from Intergraph’s traditional RADO/DBRecover system, in which the primary and secondary databases were logical copies maintained by the client. This architectural difference has implications for routine maintenance operations.

As in Intergraph’s RADO/DBRecover system, an administrator can perform *server maintenance* on the “down” (mirror) database server without impacting the live CAD system. Examples of server maintenance include: adding more memory to a server, restarting SQL Server, rebooting a server, defragmenting a server’s hard drive, installing operating system updates and adding hard drives.

Administrators need to be more careful about performing *database maintenance* in a Database Mirroring environment. Examples of database maintenance include: index maintenance, bulk data loads, purging large amounts of data, backups, and restoring a database from a backup. Unlike in a RADO/DBRecover system, an administrator cannot drop out of dual and perform database maintenance on the down database. In a Database Mirroring system, database maintenance must be performed on the current principal database. Performing bulk loads or large purges need to be scheduled at slow times, and possibly split into smaller chunks in order to minimize the impact on the live CAD
system. Backups and restores can only be performed on the principal database. Index maintenance will be covered in the next section on the editions of SQL Server.

Note: When performing maintenance tasks that require making the mirror temporarily unavailable, the administrator should minimize the amount of time the mirror is unavailable. The biggest reason is that the site is running with a single point of failure while the mirror is unavailable. Another concern is the size of the transaction log file on the principal: SQL Server cannot truncate the section of the log file which contains transactions it still needs to send to the mirror. In addition, during the resynchronization process, overall system performance may be slightly degraded. The longer the mirror was unavailable, the longer it will take to resynchronize the mirror.

**Comparison of SQL Server Standard Edition and Enterprise Edition**

Database Mirroring, transactional replication and log shipping are supported in SQL Server Standard Edition. There are several restrictions on Database Mirroring in Standard Edition, which are described below. For smaller customers, Standard Edition will be sufficient to meet their performance and availability requirements. However, for most busy CAD sites, Intergraph recommends purchasing Enterprise Edition. SQL Server Enterprise Edition has several important performance and high availability features that are not in Standard Edition.

As of SQL Server 2008 R2, both Standard Edition and Enterprise Edition support backup compression. This can greatly reduce the size of your full, differential and transaction log backups. Since log shipping uses transaction log backups, backup compression can reduce the size of the log backups, which should help reduce the network traffic and the overall latency of log shipping. Note that backup compression does require some additional CPU usage.

Here are the restrictions on Database Mirroring in Standard Edition:

1. The transaction log data must be sent synchronously to the mirror database. During normal system operation, the mirrored databases should be using synchronous communication in order to support the high safety with automatic failover mode. During certain intensive operations, such as index maintenance, bulk loading data or purging large amounts of data, administrators may find it useful to temporarily switch to asynchronous mode. Note that automatic failover is not supported in asynchronous mode.

2. The redo application mechanism on the mirror can only use one thread. If you are running Enterprise Edition on a machine with more than 4 CPUs, SQL Server will create multiple threads to apply the redo on the mirror database. This could be helpful on large databases with extremely high transaction rates.

There are other high availability features which are only available in Enterprise Edition:

1. **Online index maintenance**
   a. Online rebuilding of indexes: Tables that experience a large number of data modifications (inserts, updates and deletes) become fragmented
over time. This fragmentation can reduce performance. There are two ways to repair a fragmented index: rebuild the index or defragment the index.

i. Rebuilding an index rebuilds and defragments the entire index structure and updates statistics. In Standard Edition, rebuilding an index requires a full table lock that blocks all readers and writers. In Enterprise Edition, the locking is minimal and brief, since SQL Server temporarily creates a separate copy of the index.

ii. Defragmenting an index only defragments the leaf level; it does not move the object for better extent scan density. Defragmenting an index is performed online in both Standard Edition and Enterprise Edition, with minimal locking.

b. Online index creation. There are times when a tuning analysis shows that an additional index would significantly enhance the system’s performance. Adding an index in Standard Edition requires a full table lock. Adding an index in Enterprise Edition can be performed online.

c. Online dropping of an index. This is a less common scenario. A tuning analysis may show that an index is rarely used, and insert/update/delete statements would perform better without the index. Dropping an index in Standard Edition requires a full table lock, whereas dropping an index in Enterprise Edition can be performed online.

2. Fast recovery: In Enterprise Edition, the database is available during the undo phase of recovery. This can improve Database Mirroring failover times. During a failover, the new principal database needs to redo committed transactions, and then rollback (or undo) uncommitted transactions. In Enterprise Edition, the new principal is available for user connections after the redo phase completes. In Standard Edition, the new principal is available later on, after the undo phase completes.

3. Parallel index operations: Standard Edition only uses one thread to perform index operations. In contrast, Enterprise Edition uses multiple threads (one per CPU by default) to perform index operations. This can significantly speed up index operations.

4. Instant file initialization: SQL Server Enterprise Edition does not initialize data file contents to zero when adding or enlarging data files. This can speed the process of adding or enlarging data files. Note that log files are initialized in both versions.

Enterprise Edition contains other features that may be beneficial to large customers. Note that Intergraph has not explicitly tested these features.

1. Advanced scanning, also known as enhanced read-ahead and scan. Enterprise Edition can improve query performance by allowing multiple tasks to share full table scans.

2. Parallel consistency checks (DBCC): Enterprise Edition supports multiple threads (one per CPU by default) for DBCC commands.
3. **Database snapshots**: Enterprise Edition supports creating database snapshots on any database, including a mirror database. A snapshot is a read-only static view of the data as of the point in time when the snapshot was created. Snapshots can be used for a variety of purposes, including: reporting from a mirrored database, restoring data that is lost due to human error, and maintaining historical data for report generation. However, database snapshots must be manually created and deleted, and they can grow to take up a large amount of space if left unmaintained. The database snapshot file contains a record of data that has been modified since the snapshot’s creation.

4. **Multi-server administration**: Enterprise Edition supports centralized administration of SQL Server Agent jobs and maintenance plans.

5. **Oracle publisher**: Enterprise Edition supports transactional replication with an Oracle publisher. In other words, a SQL Server database can receive real-time updates of selected data from an Oracle database. This feature is not used by I/CAD. However, a customer may want this feature as part of an interface to an external Oracle database.

6. **Transparent Data Encryption**: Microsoft claims that organizations can turn on data encryption without impacting an existing application. Intergraph has not tested this feature.

7. **The ability to hot add memory and CPUs**.

8. **Resource governor**: Enterprise Edition allows you to limit resource usage. This may be helpful to limit the resources used by reporting applications, for example.
**Oracle Data Guard Solution**

Data Guard is an Oracle Enterprise Edition feature that provides a server-based mechanism for maintaining hot standby databases. Data Guard supports 31 databases: one primary and up to thirty standby databases. The primary communicates with the standbys using Oracle Net. While there is no hard distance limitation on how far apart the primary and standby databases can be located, the databases must communicate with each other over a network. Intergraph recommends placing the synchronous Fast Start Failover Target database at the same site as the primary database. Client applications read and write the primary database. Data Guard supports the shipping of the redo, the application of the redo on the standby, automated and manual failovers, the automatic reinstatement (resynchronization) of the old primary, and the detection and resolution of archive log gaps.

Oracle supports using Real Application Clusters (RAC) on the primary and standby databases for additional scalability and high availability. Intergraph does not currently support RAC for I/CAD databases. In addition, Intergraph does not support mixing Data Guard with the traditional RADO/DBRecover solution.

This information is valid for Data Guard in Oracle 11gR2. Oracle introduced a number of enhancements in 11g Data Guard, including the ability to read from a physical standby, manageability enhancements, faster failover times, improved security, compression of archived redo logs for gap resolution, and configurable conditions for triggering fast-start failovers. Data Guard is included in Oracle Enterprise Edition. Oracle offers several Data Guard features that require purchasing options on top of Enterprise Edition, but Intergraph does not require these options. For example, reading from a physical standby requires the Active Data Guard feature, encrypting data across the network requires the Advanced Security option, and compressing the redo stream requires the Advanced Compression feature. Note that Intergraph has not tested the Active Data Guard feature and does not support using Active Data Guard to offload the query load from CAD applications. Intergraph has not tested the Advanced Security or Advanced Compression feature, but since those features should not require any application changes, they may work fine.

**Supported Data Guard Configurations**

Oracle supports a wide variety of Data Guard configurations. In the simplest case, you will have one primary, one secondary (in Data Guard terms, the Fast Start Failover or FSFO target), an archive server maintained by DBCopy, and possibly a real-time reporting database maintained as a Data Guard standby. Intergraph recommends placing the primary and FSFO target standby at the main site. The primary communicates synchronously with the FSFO target. Every time a client application issues a commit, the client application must wait for the commit to succeed on the primary and FSFO target. Therefore, any slowdowns in the network between the primary and FSFO target or slowdowns on the FSFO target can cause application slowdowns. If a
customer has a backup site, Intergraph recommends placing an asynchronous Data Guard standby at the backup site. The following diagram shows placing the primary, FSFO target, reporting and archive databases at the main site (Site 1). In addition, the client workstations and the Grid Control and Observer are at the main site. The backup site (Site 2) has an asynchronous Data Guard standby database, and some backup client workstations.

Figure 5. A Data Guard Configuration

Intergraph CAD supports both a basic and a full Data Guard configuration. The basic configuration is limited to two physical standby databases. It consists of a primary database and a FSFO target at the main site and an additional physical standby at a remote site. The full configuration may have multiple standbys, with one physical standby designated as the FSFO target. Oracle 11gR2 supports 30 standbys, but Intergraph does not recommend having that many standbys. The overall protection level of the configuration is Maximum Availability. The primary synchronously ships redo data to the FSFO standby database. This mode guarantees zero committed data loss in the case of a failover. Intergraph recommends running the additional physical standbys in asynchronous mode in order to decrease the performance effect on the primary.

A separate archive database can be maintained via DBCopy. DBCopy pulls data from the primary and copies the data to the archive database. Unfortunately, you cannot use a logical standby as an archive database because there is no way to prevent the purging delete statements that run on the primary from being run on the logical. If you require a more up-to-date reporting server than can be achieved by DBCopy, then you can create a logical standby. The diagram shows a reporting database maintained as a Data Guard logical standby.
The client applications use Intergraph’s CADDAC (CAD Data Access layer) and the Oracle OLE DB Provider (OraOLEDB) to connect to the primary database. Data Guard keeps the standby databases synchronized with the primary database. CADDAC, in conjunction with Oracle’s Transparent Application Failover technology, facilitates a seamless client failover experience when operations fail over to a standby database.

The client applications cannot read from the physical standbys unless you use the Active Data Guard option, which Intergraph does not support. So, you cannot load balance queries across the primary and FSFO target.

**Data Guard Protection Levels**

Data Guard supports three protection levels:

- **Maximum Performance**: Logs are shipped asynchronously to the standby. Maximum Performance mode has the least effect on the performance of the primary, but offers the least protection.

- **Maximum Availability**: Logs are shipped in synchronous mode. In this synchronous mode, Oracle’s network server coordinates with the log writer and waits for an acknowledgement that the data was successfully written to disk on the standby. In Maximum Availability mode, Oracle can guarantee zero committed data loss.

- **Maximum Protection**: Maximum Protection mode offers the highest level of protection, but also the greatest effect on the primary database. In Maximum Protection mode, logs are sent synchronously, just as in Maximum Availability mode, but if log writer does not receive a response from the standby, the primary database halts operation. Oracle has said this option is mainly used by financial institutions that must guarantee that the data is stored in two places. Intergraph does not support running in Maximum Protection mode.

In order to support automatic failover (or “Fast Start Failover” in Data Guard terms), your configuration must be running in Maximum Availability mode. Intergraph only supports running Data Guard in Maximum Availability mode.

**Physical versus Logical Standbys**

Data Guard supports two types of standby databases: physical and logical.

1. A **physical** standby is an exact, block-for-block copy of the primary. In other words, the data files are identical; and the database schema, including tables and indexes, is identical. The apply engine on a physical standby is called Redo Apply. Redo Apply recovers changes from the primary’s redo data and applies the redo using the same mechanism that Oracle uses when recovering a database from a backup. Applications cannot query from a physical standby unless the Active Data Guard feature is purchased, which Intergraph does not support. Without the
Active Data Guard option, you can temporarily stop redo apply and open the database read-only for testing or verification purposes.

2. A **logical** standby contains the same logical information as the primary, but the on-disk data files may differ. The apply engine on a logical standby is called SQL Apply. SQL Apply uses Oracle’s LogMiner technology to generate SQL statements from the redo data. SQL Apply runs the SQL statements on the standby. A logical database is open read-write and can be used for reporting. In addition, a logical standby can be used when applying Oracle patches to minimize downtime during the upgrade. There are some limitations on the data types and on operations that are supported by a logical standby.

For high availability and disaster recovery, Oracle and Intergraph recommend using physical standbys. Logical standbys are best used for reporting.

**Managing Data Guard Broker Configurations**

The Oracle Data Guard Broker is a component that runs on the database server and coordinates with the Enterprise Management Agent, the observer, and the other databases in the Data Guard Broker configuration. The Broker is required for a fast-start failover configuration.

A Data Guard Broker configuration can be managed using the command-line DGMGRL interface or the web-based graphical user interface in Enterprise Manager Grid Control. The web-based interface provides a much more user-friendly view of Data Guard, and it supports additional features, including creating standby databases, verifying the current configuration, and viewing the progress of the redo log shipments and redo application on the standbys. Intergraph views the Grid Control as an essential tool in the management of a Data Guard system. The Grid Control comprises a Web Server, a repository database, and an Oracle Management Server.

In Grid Control, the Data Guard Overview page displays information about your databases.
In this example, the primary database is caddb9. The protection mode is Maximum Availability. Fast-start failover is enabled to caddb8, which is a physical standby acting as the Fast Start Failover target. Caddb8 is fully synchronized with caddb9. The “Real-Time Query” option is disabled on caddb8. Note that Real Time Query requires the Active Data Guard option, which Intergraph doesn’t support. The Data Guard configuration contains a logical standby called caddb9l. The observer is running on cadgc11101.

**Data Guard Failovers and the Role of the Observer**

Data Guard supports automatic failover (“Fast start failover”) as well as manual failover. In a fast-start failover configuration, there is a separate process called the observer. If the
primary database becomes unavailable, the observer provides automatic failover to the designated standby, which is called the Fast Start Failover (FSFO) target.

The observer communicates with the Data Guard Broker on the primary and FSFO target to negotiate the state of the Data Guard Broker configuration. The observer, the primary, and the FSFO target form a quorum. If the primary loses contact with both the observer and the FSFO target, it stalls to prevent a “split-brain” scenario because the observer may have initiated a fast-start failover to the FSFO target. Information about the current state of the configuration, including the current primary and the FSFO target, is recorded in the control file of the primary and all standbys. In addition, the Broker maintains the information in a local file.

If the FSFO target database and observer detect a failure of the primary, they initiate an automatic failover. Since all failures cannot be directly detected, Data Guard has a timeout mechanism. By default, the timeout is 30 seconds, but Intergraph strongly recommends you set the timeout to 10 seconds. If the FSFO target and observer lose communication with the primary for 10 seconds, they initiate a failover.

**Resynchronization of the Old Primary After a Failover**

Typically, there is no manual intervention required to resynchronize the old primary after a failover. Once the problem on the old primary is resolved and the old primary reestablishes contact with the observer, the observer reinstates the old primary. On the rare occasions when the observer fails to automatically reinstate the old primary, a system administrator can click the Reinstate button in Grid Control or run the reinstate command in DGMGRL.

**Impact of Failovers on Intergraph Applications**

When a failover occurs, Oracle’s Transparent Application Failover disconnects the application from the failed primary and connects the application to the new primary. Intergraph has built additional failover handling logic into the CADDAC library to provide seamless failover handling. CADDAC detects the failover and reissues any in-progress commands. Therefore, a failover should only cause a slight pause in the application while the failover occurs. You should not need to key in data again or click a button again.

**Performing Maintenance Tasks in a Data Guard System**

In a Data Guard system, there are two or more Oracle instances on separate database servers. The Fast Start Failover target is a physical standby, so it is an exact copy maintained by the primary. This is different from Intergraph’s traditional RADO/DBRecover system, in which the primary and secondary databases were logical copies maintained by the client. This architectural difference has implications for routine maintenance operations.
As in Intergraph’s RADO/DBRecover system, an administrator can perform server maintenance on the “down” (Fast Start Failover target) database server without impacting the live CAD system. Examples of server maintenance include: adding more memory to a server, restarting Oracle, rebooting a server, defragmenting a server’s hard drive, installing operating system updates and adding hard drives.

Administrators need to be more careful about performing database maintenance in a Data Guard environment. Examples of database maintenance include: index maintenance, schema modifications, bulk data loads, purging large amounts of data, backups, and restoring a database from a backup. Unlike in a RADO/DBRecover system, an administrator cannot drop out of dual and perform database maintenance on the down database. In a Data Guard system, most database maintenance must be performed on the current principal database.

- Oracle Enterprise Edition supports online index maintenance operations, and online schema changes, but the administrator must use slightly different commands. To use online index maintenance operations, the online keyword must be specified. To perform an online table redefinition, the dbms_redefinition package must be used.
- Backups can be performed on either the primary or a standby. In fact, this is one of the benefits of Data Guard: backups can be offloaded to a standby, thereby reducing the impact of backups on the live system.
- Typically, adding or removing large amounts of data in Oracle can be performed on the live database, but they should be performed during a relatively slow time. You may be able to specify the parallel hints to speed up your large data modifications. You may need to split up your large operations into smaller batches.

Note: When performing maintenance tasks that require making the Fast Start Failover Target temporarily unavailable, the administrator should minimize the amount of time the Fast Start Failover target is unavailable. The biggest reason is that the site is running with a single point of failure while the standby is unavailable. Another concern is the disk space consumed by the archive logs on the primary: Oracle cannot delete archive logs on the primary until the data is transmitted to the Fast Start Failover target. In addition, the longer the standby is unavailable, the longer it will take to resynchronize the standby with the primary.

**Additional Benefits of Oracle Enterprise Edition**

Data Guard requires Oracle Enterprise Edition. Although Enterprise Edition is more expensive than Standard Edition, it includes a number of features that could benefit Oracle customers.

1. **Online index maintenance.** Oracle Enterprise Edition supports creating indexes online and rebuilding indexes online. Standard Edition require locks while creating an rebuilding indexes.
2. **Online table redefinition.** Columns can be added, dropped and renamed online. Table can be relocated to another tablespace online.

3. **Flashback table:** This powerful feature reads the undo information to allow administrator to flashback a table to an earlier point in time. This is very useful for recovering from human error.

4. **Flashback query:** Enterprise Edition can query the undo information to allow administrators to query table data as of an earlier point in time. Administrators can also view every change to a row between two points in time.

5. **Backup and recovery features**
   a. Tablespace point in time recovery: Allows the administrator to recover one or more tablespaces up to a point in time that is different from the rest of the database
   b. Trial Recovery: Test the recovery process prior to running the actual recovery
   c. Optimized incremental backup and recovery: Improves performance during backup and recovery operations
   d. Parallel backup and recovery: Multiple threads can perform the backup and recovery operations.

6. **Parallel operations.** Certain types of queries, data modification statements and schema modification (DDL) statements can be executed by multiple threads in Enterprise Edition. In addition, statistics can be gathered in parallel mode, and Data Pump Import/Export can be performed by multiple threads. These parallel features can improve performance.

7. **Fast-start recovery time.** Administrator can bound the amount of time Oracle will take to perform instance recovery during a startup after a crash.

8. **Rolling upgrades.** Enterprise Edition supports rolling upgrades for patch set installations, in order to minimize downtime.

9. **Fine-grained auditing:** If you are using distinct Oracle logins or operating system authentication, then you can turn on fine grained auditing to determine exactly who viewed or modified specific columns in specific tables.

There are additional, extra-cost options on top of Enterprise Edition that may interest certain customers, including management packs and the advanced security option.
Network Bandwidth Requirements

The network bandwidth requirements for Oracle Data Guard and SQL Server Database Mirroring depend on your redo generation rate. Your redo generation rate is based on how much data you are changing and how quickly you are changing it. Queries do not generate redo data, so your network bandwidth requirements between the database servers are not directly affected by the query load on your primary. Of course, if the network connection between your servers is shared by your clients, then the query load on the primary will indirectly effect your overall bandwidth requirements.


Microsoft has a whitepaper on its website titled “Database Mirroring Best Practices and Performance Considerations” which discusses network requirements. Microsoft’s Database Mirroring FAQ (http://www.microsoft.com/technet/prodtechnol/sql/2005/dbmirfaq.mspx) says: “As a rough guideline, the network bandwidth should be three times the maximum log generation rate.” If you are already running SQL Server, you can view your log generation rate in the Windows Performance Monitor. The log generation rate is in the SQLServer:Database performance object, and it is called Log Bytes Flushed/sec. Note that you need to monitor this metric over a period of time to determine the average and peak log generation rates.

Migrating from RADO/DBRecover to Data Guard or Database Mirroring

Intergraph will support customers who decide to migrate from RADO/DBRecover to Data Guard or Database Mirroring. In CAD 8.1.2, Intergraph enhanced DBRecover, DSTAT, CADDBM and the RADO library in order to provide a zero down time migration workflow. Using Intergraph’s documented workflow, the customer can seamlessly transition from a RADO/DBRecover redundant database configuration to a Data Guard or Database Mirroring configuration, without any down time or data loss. Customers will need to migrate their dataset to DB Vendor HA prior to upgrading to CAD 9.2. Please see the Intergraph CAD 9.1 System Administrator’s Help for more detailed instructions on how to perform a migration.
Comparison of CAD High Availability and Disaster Recovery Solutions

Here is a summarized list comparing SQL Server’s Database Mirroring solution, and Oracle’s Data Guard solution.

- **Operating system:**
  - Both solutions can run on the standard edition of the operating system.

- **Database:**
  - Database Mirroring, transactional replication and log shipping are available in the Standard and Enterprise Editions of SQL Server. Intergraph recommends Enterprise Edition for medium and large I/CAD customers due to the fact that several other performance and high availability features are only supported in Enterprise Edition.
  - Data Guard requires Oracle Enterprise Edition. Note that Oracle Enterprise Edition provides a wealth of powerful features, in addition to Data Guard.

- **Method for keeping the multiple databases synchronized:**
  - Data Guard and Database Mirroring offer server-based mechanisms. One significant difference between Data Guard and Database Mirroring is that Oracle’s redo information is maintained at the instance level; whereas SQL Server’s transaction (redo) logs are at the database level.

- **Failover to the secondary (aka Data Guard FSFO Target or Database Mirroring mirror):**
  - Both solutions support zero-data-loss failovers to the secondary.
  - Both solutions provide seamless client failover. Aside from a slight pause during the failover, the client applications continue running without interruption. Users do not need to re-enter data or re-execute commands after a failover.

- **Failover to a tertiary database:**
  - SQL Server Database Mirroring only supports two databases. Log shipping is used to provide additional standbys. It is possible to dynamically redefine a log shipping database as the mirror in order to perform a zero data loss, zero down time planned failover.
  - Oracle 11gR2 supports up to 30 standby databases in a Data Guard system. Data Guard automatically fails over to the FSFO target standby. An administrator can click the “Failover” button to seamlessly fail over to any of the other standbys and the client applications will automatically fail over to the specified standby. In a Data Guard system, you can synchronously send redo data to multiple standbys, which guarantees zero data loss. However, running multiple standbys in the synchronous mode places heavy demand on your system and can potentially result in decreased performance.

- **Resynchronization of the databases after a failover:**
Database Mirroring automatically resynchronizes the old primary with no user interaction.

In a Data Guard system, the observer is responsible for reinstating the old primary. The observer tries one time to automatically reinstate the old primary. The attempt succeeds the vast majority of the time, so no user interaction is required. If the observer fails to reinstate the old primary, the administrator must start the reinstatement process by clicking the Reinstate button in Grid Control.

Note: In both solutions, the database remains fully operational during the resynchronization process.

- **Ability to split the primary and secondary databases across sites:**
  - Database Mirroring supports splitting the primary and mirror across two sites.
  - Data Guard supports splitting the primary and standbys across sites.

  Note: In order to support automatic failover, the databases must communicate synchronously, so placing the Data Guard or Database Mirroring “secondary” at a remote location requires a high-bandwidth, low-latency network in order to maintain the responsiveness of client applications.

- **Handling of intermittent network failures**
  - In a Database Mirroring system, the clients can automatically reconnect to the same database after a brief network outage. Any transactions that were in progress will be automatically replayed. No other clients will be impacted and no action needs to be taken by the administrator.
  - In a Data Guard system, the clients can automatically reconnect to the same database after a brief network outage. Any transactions that were in progress will be automatically replayed. No other clients will be impacted and no action needs to be taken by the administrator.

- **Real-time reporting database(s):**
  - In a Database Mirroring system, you can use transactional replication to set up one or more reporting databases that can be within seconds of the primary.
  - In a Data Guard system, you can set up one or more logical standbys that can be within seconds of the primary.

- **Additional hardware:**
  - Database Mirroring requires a reliable machine on which to run the witness. The witness can be run on an existing server, such as one of the COMM servers.
  - Intergraph recommends adding an additional, dedicated server for Data Guard on which to run the Grid Control and the observer.

- **Support**
  - Oracle and Microsoft continue to enhance and improve their database high availability solutions.
Conclusion

Oracle Data Guard and SQL Server Database Mirroring offer excellent, proven high availability and disaster recovery solutions for I/CAD high availability and disaster recovery. Intergraph has retired the RADO/DBRecover solution in CAD 9.2. Therefore, new customers need to choose Oracle Data Guard or SQL Server Database Mirroring. Existing customers should start considering a migration from RADO/DBRecover to Oracle Data Guard or SQL Server Database Mirroring. Customers can perform a zero down time, zero data loss migration to Data Guard or Database Mirroring. The I/CAD 9.1 System Administrator’s Help provides details on how to perform the migration.
QuickSpecs

Overview

HP Continuous Access EVA is an array based application that provides remote replication on the full HP Enterprise Virtual Array product family. HP Continuous Access EVA shares RSM with HP Business Copy and HP EVA Dynamic Capacity management to offer an integrated management approach. RSM manages all local and remote replication configurations, as well as, replication features across the full EVA array product line. With the combination of HP Continuous Access' unique remote replication technologies and the unparalleled easy to use RSM interface, enterprises can ensure their information is protected in the event of a disaster. Furthermore, HP Continuous Access provides the necessary components to solve enterprises business continuity objectives in a very cost effective and easily deployable package. HP Continuous Access EVA offers Simplicity without Compromise! Not only is managing replication easier, it also results in the ability to make remote replication 1) Less expensive through faster, automated methods that virtually eliminate complexity while resulting in fewer user errors. 2) Easy to deploy for accelerated payback and 3) Less labor intensive allowing a much greater use of valuable IT people resources.

What's New

- Replication support with P6300/P6500 EVA
- User selectable async feature

Models

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<td>HP Command View EVA v9.3 and Replication Solutions Manager v5.2 Media Kit</td>
<td>T5494F</td>
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Customer Benefits

- Flexible architecture allows remote replication between EVA 4x00/6x00/8x00 and the P6300/P6500 EVA. Protects existing investments and enhances business continuity planning objectives by allowing replication among the prior generation EVA family.
- Replication Solutions Manager manages HP EVA Dynamic Capacity Management, HP Business Copy EVA and HP Continuous Access EVA from one unified, easy to use GUI on the full EVA family. This new tool dramatically simplifies managing replication and results in significantly better resource utilization.
- Synchronous replication provides the highest level of data protection by ensuring that each write is complete at the primary site and secondary site before acknowledging the write to the host.
- Asynchronous replication enables quick write completion back to the host for a faster host to storage I/O response time and typically supports longer distance replication.
- Multiple relationships provide greater storage flexibility and utilization.
- HP Business Copy integration provides better efficiencies by combining the management and array technologies to create local copies.
- Fast application recovery with minimal or no transaction loss.
- Support of various interconnects saves cost by utilizing a variety of existing interconnects for long distance replication and application recovery to a metropolitan, regional or continental.
- Creation of disaster tolerant copies of your critical business data.
- No-single-point-of-failure solution to increase the availability of your customers data.

Product Features

- Advanced, automated point-n-click configuration and management through the Replication Solutions Manager GUI.
- CLUI client provides the flexibility of custom scripting.
- Fibre Channel SAN storage-based remote data replication.
- Disaster tolerant throughout with no-single-point-of-failure, synchronous or asynchronous.
- Full site, array or virtual disk level disaster recovery business continuance.
- Centralized GUI management through a general purpose Windows server, or an OpenView Storage Management Appliance (SMA).
- Bidirectional replication support.
- Automated initial normalization between source and destination.
- SAN extension support for campus, metro, and continental configurations.

Remote Replication

HP Continuous Access EVA is a Fibre Channel storage controller-based data replication (remote mirroring) solution to support disaster tolerance requirements. HP Continuous Access EVA works with the HP Enterprise Virtual Array storage system, which contains the HSV virtualized RAID controller. The HSV controller and the Virtual Controller Software (VCS/XCS) enhance virtualization with remote replication technology.

The following replication scenarios across EVA models are supported:

P6300/P6500 EVA <-> EVA 4x00/6x00/8x00
EVA 3000/5000 -> P6300/P6500 EVA/EVA4400/6400/8400 (migrate only)*

*NOTE:

- Unidirectional data migration from EVA 3000/5000 to P6300/P6500 EVA is supported using Continuous Access features.
- EVA 4400/6400/8400 to EVA 3000/5000 replication will NOT be supported.
- Fabric support will be as specified in the SAN Design Guide.
- Refer the EVA software compatibility guide for the exact firmware versions supported and other.
Storage Based

Data replication is performed at the storage subsystem controller level and is totally transparent to the host, alleviating unnecessary host cycles to perform the data mirroring functions. Unlike a fabric based or host based solution, the storage based solution dedicates its resources to managing the replication process between arrays, with minimal impact to applications, other data or devices on the SAN.

Disaster Tolerance

HP Continuous Access EVA copies data online and in real time via synchronous or asynchronous replication to a remote EVA through a local or extended storage area network (SAN). Additionally, data replication can be bidirectional, meaning that a storage array can be both a source and a destination. A particular LUN can be replicated in only one direction between the two storage arrays. Write I/O data sent to the source is replicated by HP Continuous Access EVA to the destination. A properly configured, HP Continuous Access EVA is a replication solution that guarantees data integrity in the event of a storage system or site failure.

Disaster Recovery

In the event of a disaster, HP Continuous Access EVA assures an on-line copy or exact mirror of data is available at the alternate site to support rapid resumption of critical processing at the alternate site. Resumption can usually occur within minutes, instead of hours or days, as with other disaster recovery plans.

HP Replication Solutions Manager Graphical User Interface (RSM)

HP Continuous Access EVA comes complete with an advanced management user interface called Replication Solutions Manager. RSM can optionally be deployed on a general Windows server. Please see the “Hardware and software Prerequisite sections” for more information. RSM user interface automates many of the management functions for data replication between arrays at the source and destination sites. With RSM, configuration and management is now handled through wizards and a job engine that accelerates common Data Replication tasks. Also with the addition of host agents, users can easily identify and manage storage volumes and host volumes depending on their needs. HP Business Copy (local replication) tasks are fully integrated in the Replication Solutions Manager GUI to help users replicate, protect and share data more easily. Other time-saving features include an interactive topology viewer, quick-fill templates for common tasks, integrated wizards and cross array management control of the full EVA product line.

As an option, HP Continuous Access EVA can also be managed and configured using HP Command View. HP Command View EVA provides basic configuration and management control of HP Continuous Access EVA. For more extensive management, automation and HP Business Copy integration options, the use of Replication Solutions Manager and, or CLUI client is recommended.

Synchronous Copy Operations

HP Continuous Access EVA offers synchronous data transfer mode between arrays. Synchronous data transfers offer the highest levels of data protection. With synchronous operations, both the source and destination copies are identical and concurrent at all times. Synchronous mirroring ensures that data copies are identical, to prevent critical data loss in the event of a failure or disaster. In this mode, data is written to the cache of the local storage system and the remote storage system, in real time, before the application I/O is completed, thus ensuring the highest possible data consistency. Synchronous replication is appropriate when exact consistency is critical to the business application.
## Enhanced Asynchronous Copy Operations

In addition to synchronous data transfers, asynchronous data transfer is also supported between storage arrays for long distance replication. With HP Continuous Access EVA asynchronous buffer-to-disk technology, a variety of environments can be supported for disaster recovery. The clear advantage of async is the write completion back to the host for a faster host to storage I/O response time. This may be beneficial or preferred by some remote replication configurations. In other configurations synchronous might provide just as good a response time with the full data consistency. Async or synchronous can be assigned at the DR group level. Enhanced Asynchronous Replication is supported between different EVA.

## Bi-directional

The bidirectional HP Continuous Access EVA solution addresses the growing need among businesses to ensure continuous availability of applications that are critical to daily business operations. HP Continuous Access EVA enables two sites in a remote replication connection to use each other as a destination to maintain replicated copies of online data. This maximizes resource utilization while enabling business continuance, even in the event of disaster.

## Multiple Array Relationships via Fan In, Fan out and Cascaded

HP Continuous Access EVA supports a single array having a relationship with multiple other arrays. For example, array (A) has a replicating relationship with both arrays B & C, where A is the destination for data received from B, while A is also the source for data that is replicated to C. Note a copy set still has a one-to-one array relationship. Also note that each relationship supports bi-directional use of the link.

- Fan-in with multi-relationships is a single destination array for two source arrays, not the same data, LUNs, copy set, or DR groups.
- Fan-out with multi-relationships is a single source array with two separate destination arrays, not the same data, LUNs, copy set, or DR groups.

## Normalization (first initial copy of data)

When a DR Group is created a normalization or initial copy of the data from the source Vdisk to the target Vdisk occurs. Continuous Access automatically creates the target Vdisk as part of the DR Group creation so the administrator does not have to perform that task separately.

## HP Cluster Extension Software

HP Cluster Extension software is an integrated solution that provides protection against system downtime with automatic failover of application services and read/write enabling of Continuous Access EVA target Vdisks. Cluster Extension adapts in real time, to real life situations, providing protection via rapid site recovery. Cluster Extension delivers true hands-free failover/failback decision because Cluster Extension requires no server reboots or LUN presentation/mapping changes during failover.

Cluster Extension EVA integration provides efficiency that preserves operations and delivers investment protection as it monitors and recovers disk pair synchronization on an application level and offloads data replication tasks from the host. Cluster Extension works with all supported EVA family of arrays at either the primary or secondary site. Implementation of a Cluster Extension solution assures the highest standards in data integrity by maximizing the advantages of its integration with Continuous Access EVA Software

More information on this can be found at:

www.hp.com/go/clx


## HP Metrocluster and Continental Cluster Software

Metrocluster and Continental clusters offer the most robust recovery mechanisms in the HP-UX 11i suite of geographically dispersed clusters that also includes Extended Distance Cluster.

For more information please refer to:

Metrocluster - http://h71028.www7.hp.com/enterprise/w1/en/os/hpux11i-serviceguard-
**Veritas™ Cluster Server**

Veritas Cluster Server Agents allow Cluster Server to monitor system and application resources. Application and database agents are bundled with Veritas Cluster Server. Replication agents are bundled with Veritas Cluster Server HA/DR. Veritas Cluster Server support EVA CA replication agents

**NOTE:** Veritas Cluster Agent for EVA CA is provided and supported by Symantec for more information please refer to the below link http://www.symantec.com/en/au/business/cluster-server

**SAN Extensions**

HP Continuous Access EVA provides the capability to replicate data over direct Fibre Channel. The distances supported over dark fiber are determined by the speed of the dark fiber connection and the technology used to communicate over the dark fiber. Please refer to the HP SAN Design Guide for details on transceiver distance support for different speed FC connections.

HP Continuous Access EVA also supports **Wave Division Multiplexing** (WDM) optical networks, regardless of manufacturer. WDM provides high bandwidth connectivity of enterprise level SAN over a metropolitan area network via private or public dark fibre optic networks. Remote replication via WDM is ideal when customers already have existing fibre optic cables between the two sites but are unable to install additional cables. WDM maximize the existing fibre optic infrastructure.

Support for **Fibre Channel over Internet Protocol** enables HP Continuous Access EVA to replicate data across IP networks. Several vendors have been qualified for interoperability with HP Storage products to encapsulate FC data packets into IP packets. IP data packets are transferred across an Ethernet 10/100 or GbE network. This enables users to take full advantage of their infrastructure already in place and leverage the IP knowledge.


**HP Continuous Access EVA Terms and Definitions**

- **Copy Set (CS):** Relationship between a virtual disk on a source EVA and a virtual disk on a destination EVA. Data is copied from the source to the destination. A copy set is uni-directional. The term copy set is only used to reference the connection, or relationship between virtual disks. Actions to create these relationships are executed through the creation of DR groups or by adding a Vdisk to an existing DR group.

- **Data Replication Group (DR Group):** A collection of one or more copy sets, logically grouped together for data consistency reasons.

- **Disk Group:** Pool of physical disks from which virtualization is drawing virtual disk storage.

- **Destination:** EVA with data replication functionality, which acts as the target for a given DR Group.

- **Managed Set:** Collection of DR Groups that can be failed over all at once by HP Replication Solution Manager and may span multiple HP Continuous Access EVA configurations.

- **Multiple Relationships:** A single EVA array can have a relationship with other EVA arrays.

- **Source:** EVA with Data Replication functionality, which acts as the originator for a DR group.

- **Virtual Disk (Vdisk):** A designated amount of storage space, typically with redundancy, drawn from a pool of physical disks known as a Disk Group. Virtual disks are presented to Hosts as LUNs.
Software Features/Functionality

List of prominent features of the HP Continuous Access EVA solution

- Integrated remote and local (requires HP Business Copy EVA license) replication management with HP Replication Solutions Manager
- Bi-directional replication between two system arrays
- Copyset size of 1 GB to 2 TB in 1 GB increments
- Dark Fiber distance support with long-haul GBICs and DWDM
- Fibre Channel adapter 1 Gb/sec, 2 Gb/sec, 4 Gb/sec and 8 Gb/sec host support
- Replication Solutions Manager GUI reduces complexity; saves time and cost and reduces user errors through automation
- I/O continuation during normalization and merging
- Mixed 1 Gb/sec, 2 Gb/sec, 4 Gb/sec and 8 Gb/sec FC switch mixed configurations (single vendor)
- Multi-vendor platform support
- Non-disruptive software upgrade capability
- Normal and failsafe modes
- Mirrored write-back cache support
- Selective storage presentation for SAN-based data zoning
- Sequential I/O-based replication maintaining write order operations
- Suspend and resume operations
- Asynchronous and Synchronous mode of operation
- Up to 256 single member DR Groups (limited to 16DR Groups on EVA 4400)
- Up to 256 Copy Sets
- Enhanced Asynchronous replication support
- Virtual RAID arrays (Vraid0, Vraid1, and Vraid5)

Local replication features (licensed through HP Business Copy EVA) that enhance HP Continuous Access EVA

- Virtually capacity-free snapshot (space efficient)
- Virtually instantaneous Snapclone
- 3-Phase Snapclone and Snapshot
- MirrorClone with delta resync

**NOTE:** Additional information on supported capabilities

- HP EVA Replication Software Release Notes
- HP Replication Solutions Manager Administrator Guide
- HP Continuous Access Implementation Guide
  
The following are benefits of the EVA solution:

- Powerfully simple set-up and management with HP Replication Solutions Manager saves time; allows resources to be more efficiently deployed and reduces user errors.
- Outstanding self-tuning performance ensures consistency in meeting application Service Level Agreements. This allows users and clients to accomplish more in less time, to scale capacity on demand, and to minimize data administration overhead.
- State-of-the-art virtual controller software, with virtualization technology, helps improve performance, increases disk utilization efficiency, and allows for easy dynamic storage expansion, all of which helps lower costs.
- HP Business Copy EVA software provides virtually capacity-free snapshot (Vsnap) function can save significant disk space and improve disk utilization efficiency.
- HP Business Copy EVA includes the MirrorClone feature that provides an alternative to a snapshot by allowing the user to make a full, byte-for-byte, point-in-time copy of a source LUN that can be mounted to a secondary server. MirrorClone will track all changed blocks and can re-sync with the source LUN to create a new point-in-time copy, or can be used to instantly restore the source. Also, included is the virtually instantaneous Snapclone copy capability allows immediate use of the clone copy that can accomplish significant savings of time.
- HP Continuous Access EVA ensures protection of valuable data, through remote replication, following a planned or unplanned outage.

List of Hardware Supported

EVA Models are modular, scalable, no-single-point-of-failure solutions with disaster tolerance and business continuance support for storage consolidation on heterogeneous SANs. HP Continuous Access is available on the P6000 and the EVA family. HP Replication Solutions Manager can configure and manage HP Continuous Access EVA and HP Business Copy EVA across the full EVA product line.
## QuickSpecs

### HP Continuous Access EVA

### Ordering Information

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<th>Model Description</th>
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</table>
1HP Data Migration LTUs can be combined with HP Continuous Access LTUs.

2Licenses obtained through the Not-For-Resale (NFR) program, temporary licenses, loaner licenses, Instant-on or any other license at no charge are provided strictly for evaluation and demonstration use and cannot be used for data migration.

3The Data Migration Licenses TA663A (AE) and TA664A (AE) are model agnostic and work across all EVA models; however they require Command View version 9.0 or higher.
Documentation

- Thank-you letter
- HP Replication Solutions Manager kit contents
- HP Software License Terms, the End User License Agreement to use HP Replication Solutions Manager
- HP Software License Terms, the End User License Agreement to use HP JREserver
- NSS LP Customer Survey Notice, an invitation to give feedback on HP documentation
- HP Replication Solutions Manager CD
- HP Replication Solutions Manager host agents CD
- HP Replication Solutions Manager documentation CD

Additional information online

http://www.hp.com --- HP home page
http://www.hp.com/hps/ --- HP Services home page

Software Licensing Terms

A license (LTU) enables the array to replicate data from a source EVA to a destination EVA storage system array. Without a HP Continuous Access EVA license the data replication features are not available for configuration or utilization on the array. A license key must be purchased in order to enable HP Continuous Access EVA on the VCS/XCS firmware. HP Continuous Access also allows replication between the entire EVA family. In this case, the user would purchase the appropriate LTU based on the array model for each system. You can reference the licensing part numbers in this QuickSpecs in the section titled Ordering Information.

NOTES:

1. When ordering a HP Continuous Access EVA license SKU, licensing is on a per array basis.
2. HP Replication Solutions Manager is included at no additional charge with the purchase of either HP Business Copy EVA, or HP Continuous Access EVA Software.
3. HP Continuous Access EVA licenses are not transferable to like, or unlike EVA models. When enabling HP Continuous Access EVA features on an EVA a new license must be purchased, or in some cases an upgrade license may be purchased if upgrading an existing EVA array's model that already has HP Continuous Access enabled.
4. When using HP Continuous Access EVA, each array that is part of the remote replication solution must have the appropriate license. The total licensed capacity for a HP Continuous Access LTU is based on the replicated source volume(s) usable capacity.
5. With the new Replication Solutions Manager GUI, both remote replication and local replication features can be managed. For all of these features to be enabled, both HP Continuous Access (remote replication features) and HP Business Copy (local replication features) must be licensed. If any feature is not licensed, the action will fail and be logged in the event pane. Please note that when using the Cascaded Replication feature both a HP Business Copy and an HP Continuous Access license must be installed at the intermediary site where a Snapclone of the data is required.
6. Licenses obtained through the Not-For-Resale (NFR) program, temporary licenses, loaner licenses, Instant-on or any other license at no charge are provided strictly for evaluation and demonstration use and cannot be used for data migration (Please see ordering information for data migration part numbers). These licenses do not include support services, may or may not include product documentation and must comply with all terms, conditions and time limits.
**QuickSpecs**

**HP Continuous Access EVA**

**Ordering Information**

**HP Continuous Access EVA Order Scenario Examples**

**Example 1:** Customer orders an EVA6400 and an EVA8400 and wants to replicate data using HP Continuous Access EVA

**Answer:** The customer should order a HP Continuous Access Software LTU for each array. Each array has its own set of part numbers and pricing based on the array model.

**Example 2:** Customer would like to migrate data from their HP EVA6100 to a new HP EVA8400. The HP EVA8400 will be configured for remote replication with another existing EVA8400 that already has HP Continuous Access licensed.

**Answer:** The customer must purchase HP Continuous Access EVA Data Migration 7TB 90 Day LTU (TA663A) or HP Continuous Access EVA Data Migration Unlim 90day LTU (TA664A) based on the amount of data that needs to be migrated for the EVA 6100 and an HP Continuous Access EVA8400 Series Unlimited Software License (TA671A) for the new EVA 8400.

**Example 3:** The customer upgrades from EVA 4100 to EVA 6400, can the customer transfer the Continuous Access EVA licenses from EVA 4100 to EVA 6400?

**Answer:** The Continuous Access EVA software licenses are not transferable. So the customer must purchase a new Continuous Access EVA software license for EVA 6400.

**Example 4:** The customer upgrades from an EVA 4100 to EVA 6400, can the customer use model upgrade licenses?

**Answer:** Model upgrade licenses are only supported for within the family or data in place upgrades. So the customer must purchase new Continuous Access EVA software licenses for EVA 6400.
HP Care Pack Services offer upgraded service levels to extend and expand your standard product warranty with easy to buy, easy to use support packages that help you make the most of your hardware and software investments. They let you choose the support levels that meet your business requirements, from basic to mission-critical. They help you contain total cost of ownership.

HP Care Pack warranty extensions can be purchased along with HP products to cost-effectively upgrade or extend your warranty. For many products, post-warranty HP Care Pack Services are available when your original warranty has expired.

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- Give you direct access to proven technical and problem-solving expertise
- Offer a choice of response-time and repair-time commitments
- Deliver prompt, measurable results
- Are available whenever and wherever you do business

HP Care Pack availability may vary by country and product.

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Includes one year of HP Software Support 9 x 5 (software technical support and software product and documentation updates)

HP warrants only that the Software media will be free of physical defects for a period of ninety (90) days from delivery.

For more information about HP's Global Limited Warranty and Technical Support, visit:
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- Enjoy rapid results when you deploy industry-leading HP Data Replication technologies
- Provides optimal solution to meet your IT and business needs via flexible, scalable

Three years of HP Software Support 24 x 7

- Improve the productivity of system managers and operators
- Improve system performance and reduce downtime due to software defects
- Expedite problem resolution through expert-level technical resources
- Enjoy consistent service coverage across geographically dispersed sites
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- Take advantage of subscription savings on software updates
- Keep your license compliancy up-to-date

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Extend your product warranty with a wide choice of cost-saving support packages.

HP Care Pack Services are sold by HP and HP authorized enterprise and commercial resellers. Services for customers purchasing via direct and enterprise resellers are quoted using HP order configuration tools. Additional information about HP Care Pack Service features and benefits is available at http://www.hp.com/hps/carepack/services/.

Key for HP Care Pack Service availability in the table below:

E = Service available for customers purchasing direct and via enterprise resellers
B = Service available for customers purchasing via commercial resellers
N/A = Service not applicable

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For more information about Deployment and Per Event Services for HP Storage, visit http://www.hp.com/hps/storage/.

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To find HP Care Pack Services available via HP authorized commercial resellers, visit http://h30125.www3.hp.com/csn/salesmktg/elfpack/elf_nonlkup_ctrylang.asp?code=elnl
## QuickSpecs

### HP Continuous Access EVA

### Service and Support, HP Care Pack, and Warranty Information

#### Deployment and Per Event Service Descriptions

**HP Data Replication Solution Service**

Ensures a timely, cost-effective deployment of your data replication solution that cuts risk and shortens your time-to-results.

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The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment.

**Features include:**

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- Efficient logging and tracking of support cases
- Collaboration with other business and IT professionals
- Download of patches and drivers
- Access to diagnostic tools
- Proactive notification of relevant information

Access to certain features of the support portal requires an HP service agreement. To access the support portal, visit [http://www.hp.com/support](http://www.hp.com/support)

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ISEE is a feature of HP Hardware Support Onsite Service with Next-Day response or better, Proactive Essentials, Proactive 24, Critical Service and warranty support for the selected products.

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#### HP Education Services

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Disaster Tolerant Management Service

This service leverages HP’s industry-leading clustering and HP Continuous Access technologies plus HP’s worldwide recovery centers to provide customers with a cost-effective, proven approach to disaster tolerance. A complete life cycle suite of services addresses customer facilities, infrastructure design and implementation, monitoring and management of the infrastructure, a comprehensive disaster recovery plan, staff training, and periodic rehearsals. The service provides a business solution approach to disaster tolerance with proven quality of service and a single point of accountability. It delivers predictable recovery times and right-first-time implementation with worldwide, multi-site solution deployment.

DT Managed Services include:

- Pre-installation briefing, configuration verification, and project appraisal
- Dual redundant management station installation and customization
- Disaster tolerance lab training for system managers and operators
- Technical recovery plan review
- Disaster recovery test suite design and execution

Product Support

Product Support gives the customer access to HP’s experienced technical support resources as well as access to HP’s Information Services database for support on a variety of multi-vendor/multi-platform software products. Product support includes escalations and problem coordination with the appropriate engineering group. HP Services offer a variety of options to allow you to tailor your product service to meet the needs of your organization. Basic services on products can be uplifted from day one to ensure you receive the service you need when you need it.

Software product services

1. Standard software support (HP Care Pack or annual support contract) 24 x 7 is available 24 hours per day, Monday through Sunday, including holidays, and access rights to new versions, software product and documentation updates.
2. Installation and Startup Service (software installation, configuration, startup testing and knowledge transfer)
3. Tailored support contracts based on personalized statement of work: contact your local support center via http://www.hp.com/support/.

HP Care Pack services ordered via:

Pre-merger HP sales systems are configured using Sales Builder for Windows and must be ordered with the product.

The following services are offered as HP Care Pack Services at the time of product order

For additional software product services information for North American HP Care Pack services, as well as orderable part numbers, please refer to the URLs listed below:

All storage services: http://www.hp.com/hps/storage/
Care Pack Priority Services: http://www.hp.com/hps/carepack/storage/cp_networked.html
Installation and Startup Service: http://www.hp.com/hps/storage/ns_replication.html
QuickSpecs

Service and Support, HP Care Pack, and Warranty Information

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Intergraph Corporation
I/CAD Map Data Requirements

Summary of the I/CAD MAP
Data Structure and Requirements
CAD 9.1

Version 2
Revision 1
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INTRODUCTION

The main purpose of this document is to provide a high-level description of the information required to create I/CAD Map data. It is intended to be used by the I/CAD project team, including Project Managers, Implementation Specialists, System Administrators and GIS departments, in determining what data sources may be desired and/or available for use in creating the I/CAD Map.

In support of this, a short description of how this map data is used within the I/CAD software is given, as well as information on the various data models that may be used by the I/CAD Map.

This document is an expanded version of the I/CAD Map Specification document and contains an introduction to a number of map related concepts such as:

- Addressing verification model used by I/CAD,
- Data structure(s) required to support the I/CAD Map,
- Sources and formats of potential Map data,
- Software and workflows used to create and maintain the I/CAD Map

This document however is only intended as an introduction to the I/CAD Map Environment, for more detail please review the following supporting documents:

- I/CAD Map Specification
- I/Map Editor Training Guide
- I/Dispatcher Help File
- CAD System Administrator Help File
- CAD Essentials Training Guide

Note: This document is applicable for CAD version 9.1
How I/CAD Uses Map Data

The primary use of the map data in the I/CAD environment is to identify and verify the location of an event or unit. When the location of an event or unit can be related directly to a unique point on the ground (in the ‘real world’) the I/CAD system can then be used to automatically drive other dispatch-related functionality, for example:

- Which agency should respond to this location?
- Which units are closest to the event?
- Which units can get there quickest?
- Are there any other incidents occurring nearby?
- Are there any special circumstances related to that location (e.g. Government Building)?
- What other information is associated with this area?

All of these questions require that the system (and therefore the Dispatcher) knows exactly where the incident is occurring and where potentially responding units are located within each agency’s jurisdiction (or surrounding area). With the increasing commercial availability of hand-held and vehicle-mounted navigation devices (Sat-Nav) this concept is becoming more and more familiar to the general public and can be summarized into two main questions: Where am I? What is around me?
LOCATION VERIFICATION

This is the term given to the process used in the I/CAD environment (I/Calltaker, I/Dispatcher, NetViewer, NetDispatcher, I/Mobile and I/LEADS) to determine the exact location of an incident/event within the I/CAD Map data. The end result of this process (when successful) will be a single XY coordinate associated with the event record. Although the I/CAD system will allow an incident to be created and managed without an verified XY location, much of the functionality of the system will be either reduced or require an increased level of manual intervention.

Most incidents, for most Public Safety agencies worldwide, are likely to be located or identified by street addresses (e.g. 123 MAIN ST). When not identified by a street address, an incident or unit's location is usually reported instead as being at a 'named location' or Common Place-name (e.g. MCDONALDS), which in most cases can then be related to a street or mailing address. Purely geographical locations unrelated to the street network may also be used as long as they relate to a single XY location.

Examples of locations that can be verified within the I/CAD Map data include:

- Street addresses, e.g. 123 MAIN ST
- Apartment or Room number at a Street Address, e.g. 456 MAIN MALL, 23
- Intersections, e.g. SECOND AVE/MAIN ST
- Common place-names, e.g. MCDONALDS, COURT HOUSE
- Geographical locations, e.g. BIG ROCK LOOKOUT, BANDSTAND
- Geographic, or Lat/Log GPS location, e.g. 86:32:49.1235, 34:56:21.7654
- Monitored Alarm permit number, e.g. ADT123

If an incomplete or ambiguous address is supplied, the system will assist the Call-taker or Dispatcher in refining the location information in order to arrive at a single XY position within the I/CAD Map.

For more detailed information on options for specifying event locations please see the following documentation:

- I/Dispatcher Help Files
- CAD Essentials Training Guide
DETERMINING DEFAULT AGENCY RESPONSE

One of the main reasons for identifying an incident or event’s geographic location in the I/CAD Map is to determine its Agency Response. In most cases the responding agency (or agencies) will depend on which jurisdiction the event falls within (as well as the incident type). Any backup response, or agencies providing mutual aid, will also primarily depend on the location of the event, as well as the most efficient travel corridors to that location. Although the Dispatcher will always play an important role in this determination, much of this information can, and should, be provided automatically from the map data.

For most Public Safety agencies there is a further devolution of responsibility within their jurisdictional boundaries, and again this is generally dependant on an event’s geographic location. For Law Enforcement agencies this hierarchy may be along the lines of: Command > District > Beat, for Fire or EMS agencies this may be Division > Battalion > Station. In some cases however a unit’s responsibility may be functional (e.g. Traffic Enforcement, or HAZMAT) rather than geographic.

The I/CAD system uses a combination of the incident type and the geographic location to define the default agency response. The I/CAD Map data responsible for determining the geographic part of this equation is the ESZ (Emergency Service Zone) layer.

Diagram of how ESZs (numeric areas) may be grouped into Beats (colored alpha-numeric areas)
An ESZ can be defined as being the smallest geographic area of response, or reporting, available in the system. An ESZ may be associated with a point feature (for example a school building, or a hazardous chemical storage room), but is more generally defined as a geographic polygon.

Each agency covering a specific geographical area must have a set of contiguous, non-overlapping polygons covering their entire response area. When the event XY location is confirmed, the I/CAD system determines which agency ESZ polygon(s) this falls. ESZ areas are assigned to beats using the deployment tables defined in the I/CAD database. ESZs may be reorganized into different beat groupings at any time using these tables. Although it is often useful to have as static representation of these ‘beat boundaries’ displayed in the I/CAD Map, the definition of these are not controlled by the map data itself.

For more detailed information on planning agency response and deployment please see the following documentation:

- I/Dispatcher Help Files
- I/CAD Deployment Planning Training Guide
ROUTING AND UNIT RECOMMENDATION

Since one of the most prevalent features in the I/CAD Map is the street network (used for the addressing system), this data can also be used for generating driving routes within the map. The main use of this functionality is to determine best routes of travel to an event depending on selected criteria (e.g. time, distance). This is also used when determining the closest units for unit recommend, in conjunction with the ESZ and Beat/Backup Beat deployment information.

Routing within the street network depends on the correct information being available within the map data, this includes speed limits, physical constrains (such as low bridges) and one-way streets. It also requires that the street network be topologically correct and connected.

For more detailed information on Unit Recommendations and Routing please see the following documentation:

- I/Dispatcher Help Files
- I/CAD Recommend Unit Training Guide

DEFINING OTHER GEOGRAPHICALLY RELATED INFORMATION

Although not required for the operation of I/CAD applications, other data items (such as building symbols, water features and neighborhood boundaries) in the I/CAD Map can also be used to supply a wealth of additional information that can be used for:

- Event location confirmation
- Supplying situational information
- Assisting on-scene units
- Finding closest specialized location such as Hospitals
- Geographic-based reporting based on custom categories of data
I/CAD Map Data Models

This section provides a high-level description of the three main data models used in the I/CAD Map for Location information. Detailed information on each of these can be found in the accompanying document “I/CAD MAP Data Requirements II (Detailed Description of the I/CAD Map Data Structure and Requirements)”.

LINEAR STREET NETWORK

The most common I/CAD Map data model is a street centerline linear network comprised of individual street segments connected at intersections. This network should be topologically correct in that there are no; overshoots, undershoots, dangles, duplicate lines, zero length lines, etc. The street segment features should also contain the attribution information required by the I/CAD address verification process, for example:

- upper and lower number ranges,
- street name,
- street type,
- municipality name
- and any directional information such as North or South.

Often this street centerline data is the only information available for use in the location verification and may require interpolation along a segment to result in a confirmed XY coordinate location for an address. Street aliasing is also available.

Unlike other linear features in the map data, the street network feature set should be regarded, and maintained, as an internally integrated network. Topology within the street feature set is paramount. Topological interaction (i.e. intersections) with other linear features within the map data such as water features, railroads and administrative boundaries, is usually optional. The only exception to this would be where the other feature boundary results in an attribution change on the street segment. An example of this would be where a municipal boundary crosses a road segment – the segment must be broken at the boundary intersection as the resulting two sections would have different municipality attribute values.
Diagram showing Linear Street Network and associated Features

In Appendix – Map Feature Attribution, the table structure and attribute information used for the main I/CAD Map street centerline data is described. It is similar to the US Government TIGER structure and many commercially available datasets.

POINT LOCATIONS

Another common Map data model is the “address point” or “special address” model. With this data each individual address point in the service area is identified by a single point feature attributed with relevant address and other information. The geographic location of these address points is often derived from property parcel centroids, but may also indicate the front door of a building on a lot, or the threshold of a driveway.

These address points do not necessarily relate to the nearby street network (in that they do not have to contain the same addressing information as the nearby street segment), however centerline graphics are still needed to perform the important routing tasks. Point locations are often used for identifying sub-locations within a larger complex (such as individual businesses within a shopping mall), or for more rural locations that may be ‘off the beaten track’ (e.g. shelters along a hiking trail). These address points may also be associated with common place-names or aliases, and may even have unique response information associated with them.
HYBRID POINT-LINE LOCATION VERIFY MODEL

For most customers, the I/CAD Map data will actually be a hybrid of the two data models – linear network and address points. This combination of data provides a more robust model for determining location information than either of its two components alone.

Where individual address points are available in the map data the I/CAD Location Verification process will attempt to match to this data model first. If a unique XY location cannot be derived from the point data the system will use the street centerline information to determine the required coordinates.

In this situation, the more address points that are available - and the higher percentage of validation ‘hit’s provided by these - the less relevant the street data addressing information will become. The street network however will still be required for routing and recommendation purposes, as well as to provide a backdrop display for vehicles equipped with AVL (Automatic Vehicle Location). This hybrid model also reduces the need for constant upgrades to the street network since address points may be used to ‘fill-in’ and maintain goals of map comprehensiveness and currency.

Illustration of Hybrid Data Model
incorporating Linear Street Network with Point Address Locations
BOUNDARIES AND POLYGON DATA

As described in the previous section, the ESZ deployment information used by the I/CAD system is derived from a geographic Point-in-Polygon method. Other area map features, such as political or administrative areas, may also be described by polygons or by simple boundaries in the map. In most cases the attribution required for these features is minimal.

Any area features that are to be used in the I/CAD Map should follow the basic rules for GIS area data in that:

- Area boundaries that follow other area or linear features must be co-incident with, or share geometry with, those features
- Attribution may be assigned either to the area boundary or an area centroid
- Boundary linework must not include invalid geometry such as ‘kick-backs’ and ‘bow-ties’

Depending on the use for the area feature in the I/CAD system, some area features (such as wrecker service areas) can include overlapping polygons, whereas others (such as ESZs) may not.

MAP PROJECTION SYSTEM

Regardless of the data model to be used for Address Verification in I/CAD, a Map file and some database attribution will be required. In order for this map to be displayed in I/CAD, and for it’s coordinate information to be of any use, the following associated information will be required:

- Projection System
- Mapping units (or units of resolution)

Since in most cases the final I/CAD Map data is compiled from a number of different sources, these may potentially all use different projection systems and units. The consolidation of these into a single system is done during the map creation process using GeoMedia and I/Map Editor.
MAP Data Formats and Sources

THE I/CAD MAP FORMAT

The map data used by the I/CAD system is a combination of database information linked to graphic features displayed in a map file. This system has been specifically optimized for speed, both in accessing the table data for verification, and for display of the graphical information to the Dispatcher.

Due to the overriding requirement for rapid system response, the map file used by I/CAD uses a proprietary Intergraph format generated from commercially available sources. In addition specific functional information (such as Routing information and Deployment ESZ polygon boundaries) is generated from the base graphic and attribution data, and stored locally in binary-level files.

CREATING THE I/CAD MAP

The I/CAD Map data, both database information and graphic map file, is generated using a process based on the Intergraph GeoMedia GIS platform. This process is often customized for a specific customer site and may vary considerably depending on the data sources available and the frequency of data updates.

The GeoMedia environment is used to perform the main data compilation and validation tasks common when creating geographical data. These include:

- bringing variant data sources into a common projection and coordinate system,
- combining features from different sources into a single dataset,
- finding and correcting topological errors,
- defining graphic symbolization
- generating additional map features (such as text) from other features and attribution.

After the geographical data has been compiled, edited and symbolized, a GeoMedia application called I/Map Editor is used to publish the selected features into the I/CAD environment. The process of publishing the map also builds a topological network from the linear street centerline features. In addition I/Map Editor includes some extra validation and feature processing tools specific to the I/CAD Map data. Output from I/Map Editor will be the database information, a map file and any polygon files required by the system.
POTENTIAL SOURCES FOR I/CAD MAP DATA

This section covers many of the more common data sources used in the creation of an I/CAD Map. This should not be taken as a comprehensive list of sources since other data options are often available that are specific to a customer. By describing the most often used types of data sources and formats, it is hoped that this will encourage a search for other similar data sources that may provide additional information that may be unique and valuable to a specific Public Safety or Dispatching organization.

In determining potential sources of map information, cost of the data is often the overriding decision factor. However it is also important to consider information on the comprehensiveness and currency of the data, and of any expected maintenance or frequency of update of this information.

Address information

Since the software platform used to create the I/CAD Map data uses the GeoMedia GIS environment this data (with associated projection information) may be supplied in a wide range of different GIS formats, including:

- ESRI Arc/Info
- AutoCAD
- Arc/View Shapefiles
- MGE

The main I/CAD map data is expected to be an attributed street network. As a minimum this should include:

- the geometry of the street segments,
- basic street naming information and
- some level of feature classification.

In some cases, particularly for city or county-wide systems, some (or all) of this information may be supplied from an affiliated GIS department. In many other situations this will require the purchase of commercially produced and maintained data. Although Intergraph does not have a preferred supplier, and cannot vouch for the quality of the data supplied by a specific company, some companies that have supplied data for I/CAD Map creation in the past are:

- GDT
- NavTech

Point Address information may also be provided from a variety of sources. Often many of these may be internal or closely affiliated with the dispatching organization but may be unaware that they possess potentially valuable information. In order to be useful in the I/CAD system, any point address information will need to contain a minimum of a street address and/or an XY location (with accompanying projection information). This data can be supplied in any number of common GIS formats (see above) or as an ASCII formatted file. Potential sources of this information include:
• Tax Assessors or Property Management Offices
• Operational divisions of Utility or Transport agencies

**Area boundaries**

Some area data such as municipal boundaries may already be available, and reasonably current, in digital form. Including this type of data into the I/CAD Map is relatively straightforward and the data can be supplied in any for the formats used by GeoMedia. In general the format of this type of data will be a set of boundary shapes or connected line-strings. Required attribution is minimal (often a single value per area) and may be associated with either the boundary line-work or a polygon centroid.

In many cases however, deployment data such as ESZs or beats, either do not currently exist in digital form (if at all in the case of ESZs) and may only be available drawn on a hardcopy map. Another example of this type of area boundary that may only exist as an area description and not even pictured on a map, is that of the service zones assigned to tow or wrecker companies (e.g. North of Main Street, West of the river). In these cases the boundary features must be digitized as a new map feature using either the GeoMedia platform or another available GIS program. Note that digitizing this information will require time, as well as an understanding of the areas involved. Since ESZ polygons are crucial to the effective operation of the I/CAD system, if it is necessary to create these area features from scratch this must be given high priority in the project.

**Other Geographic Data**

There are numerous geographic features that may be added to the I/CAD map that can enhance the Dispatcher’s understanding of an event’s surrounding area or assist on-scene personnel in the overall handling of an incident.

This ‘situational awareness’ type of information may be:

• a purely graphic display such as an aerial photograph,
• or may include attribution such as property owner’s name and contact information,
• or a combination of the two where an attribute value results in specific symbology, such as a school building being represented by a different graphic symbol than a hospital.

Since this type of information is not part of the required data for I/CAD it may be added at any time. It is often the case that this is added as the system matures and as uses for this information are found. This type of data may be supplied in any of the GeoMedia digital data format previously notes. For geo-referenced raster files the primary supported formats are: GeoTIFF, Intergraph raster formats and USGS DOQ. Other common raster formats such as MrSid, TIFF and JFIF may also be used but require an associated world file with geo-referencing information.
Appendices

BASIC MAP TERMINOLOGY USED IN THE I/CAD MAP

ADDRESS POINT
Point Features used to designate the location of features such as houses, schools, businesses etc. Address points do not form part of the Street Network but may be located in the map using coordinates and attribution stored in the SP_AD and CO_PL database tables.

BEAT
A Beat is defined as an Area of Responsibility for a unit (usually Law Enforcement). This is not necessarily displayed or identified as an area feature in the map. Beats are created in CADDDBM by assigning one or more ESZ’s in the I/CAD database deployment tables (ESZ and BEAT).

ESZ
Otherwise known as an Emergency Service Zone, this is a geographical area feature although is not necessarily displayed in the map itself. An ESZ is the smallest geographical response area defined in I/CAD and is used as a building block to determine agency and unit responses and assignments. ESZs may be defined as agency specific and are created from attributed polygons. The geographic definition of an ESZ is stored in the Polygon Files.

FROM and TO NODES
From and To Nodes are topological point features that identify the beginning and end of Street Segments. To To-From designation of the two ends of the segment is determined during the initial digitization of the linear feature and are used to define the Left/Right ‘sides’ of the segment. Node information is stored in the database in the CD_NODE table and referenced by the CD_EDGE table.

INTERSECTION
Intersections contain the attribute information associated with Nodes and are defined for all places where two or more street segments meet. Intersection information is stored in the INTER and INTER_STR tables in the database and reference the CD_NODE table.

SEGMENT
Segments are linear features that are linked together (end-to-end) to form Street Centerlines in the I/CAD map. Segments are topological entities that carry specific street centerline data, their information is stored in the SEGME and CD_EDGE database tables.
VERTICES

Vertices are points along a linear features (such as a street centerline) that are used for define curves or bends in the feature. Vertices do not define the beginning and end of a linear feature, only it’s shape. Vertex information is part of an I/CAP map feature and is not stored in the I/CAD database. The maximum number of vertices allowed for a single unbroken linear feature is currently 8000.
MAP SOURCE DATA ATTRIBUTION

This section details the main data attributes associated with the linear street segments and point addresses that are used in the I/CAD mapping system. The attributes are shown with both the I/CAD naming convention and a short description to aid in matching these up with potential source information. The "datatype" column shows both Oracle and SQL Server conventions.

This is intended as a guide to evaluating potential data sources, it does not describe the I/CAD data schema in detail. The attributes defined in **bold** are required items that must be supplied in the source data. Other attribution in *italics* is highly desirable. Additional information may be accommodated within the address/routing data model or may be used to generate additional map features.

Schema changes made for the CAD 9.1 version are highlighted in **yellow**

Note that it is highly desirable that address information be supplied in a parsed format (each data item contained in a separate attribute column).

**Linear street data**

<table>
<thead>
<tr>
<th>I/CAD Column</th>
<th>Datatype</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>segid</td>
<td>number (10) / int</td>
<td>Unique segment ID</td>
</tr>
<tr>
<td>fcode</td>
<td>varchar2(12) / varchar2(12)</td>
<td>Feature classification code</td>
</tr>
<tr>
<td>feanme</td>
<td>varchar2(30) / varchar2(30)</td>
<td>Street name (without type)</td>
</tr>
<tr>
<td>featyp</td>
<td>varchar2(4) / varchar2(4)</td>
<td>Street type</td>
</tr>
<tr>
<td>dirpre</td>
<td>varchar2(2) / varchar2(2)</td>
<td>Street direction prefix (if used)</td>
</tr>
<tr>
<td>dirsuf</td>
<td>varchar2(2) / varchar2(2)</td>
<td>Street direction suffix (if used)</td>
</tr>
<tr>
<td>fraddl</td>
<td>varchar2(11) / varchar2(11)</td>
<td>low address range for the left-hand side of the street segment</td>
</tr>
<tr>
<td>toaddl</td>
<td>varchar2(11) / varchar2(11)</td>
<td>high address range for the left-hand side of the street segment</td>
</tr>
<tr>
<td>fraddr</td>
<td>varchar2(11) / varchar2(11)</td>
<td>low address range for the right-hand side of the street segment</td>
</tr>
<tr>
<td>toaddr</td>
<td>varchar2(11) / varchar2(11)</td>
<td>high address range for the right-hand side of the street segment</td>
</tr>
<tr>
<td>munl</td>
<td>varchar2(40) / varchar2(40)</td>
<td>If not supplied on the linear data</td>
</tr>
<tr>
<td>Field</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>munr</td>
<td>varchar2(40) / varchar(40)</td>
<td>If not supplied on the linear data these may be able to be derived from a municipal boundary polygon layer</td>
</tr>
<tr>
<td>alias</td>
<td>varchar2(30) / varchar(30)</td>
<td>Any alias names used for a specific street segment</td>
</tr>
<tr>
<td>def_speedlimit</td>
<td>number (5) / smallint</td>
<td>Default speed limit for this street type</td>
</tr>
<tr>
<td>def_height_limit</td>
<td>float(126) / float(53)</td>
<td>Default height limit for this street type</td>
</tr>
<tr>
<td>def_weight_limit</td>
<td>float(126) / float(53)</td>
<td>Default weight limit for this street type</td>
</tr>
<tr>
<td>def_width_limit</td>
<td>float(126) / float(53)</td>
<td>Default width limit for this street type</td>
</tr>
<tr>
<td>speedlimit</td>
<td>number (5) / smallint</td>
<td>Speed limit for this street segment</td>
</tr>
<tr>
<td>height</td>
<td>float(126) / float(53)</td>
<td>Height limit for this street segment</td>
</tr>
<tr>
<td>weight</td>
<td>float(126) / float(53)</td>
<td>Weight limit for this street segment</td>
</tr>
<tr>
<td>width</td>
<td>float(126) / float(53)</td>
<td>Width limit for this street segment</td>
</tr>
<tr>
<td>blockage_mask</td>
<td>number (10) / int</td>
<td>Information relating to one-way streets</td>
</tr>
<tr>
<td>turn_mask</td>
<td>number (10) / int</td>
<td>Information relating to routing restrictions (e.g. no left turn)</td>
</tr>
<tr>
<td>obstacle_mask</td>
<td>number (10) / int</td>
<td>Information relating to routing restrictions (e.g. stop light)</td>
</tr>
<tr>
<td>addtyp</td>
<td>number (10) / int</td>
<td>House numbering method (e.g. odd/even, contiguous)</td>
</tr>
<tr>
<td>areal</td>
<td>varchar2(40) / varchar(40)</td>
<td>Other area location information (e.g. state)</td>
</tr>
<tr>
<td>arear</td>
<td>varchar2(40) / varchar(40)</td>
<td>Other area location information (e.g. state)</td>
</tr>
<tr>
<td>loc_fld2l</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
<tr>
<td>loc_fld2r</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
<tr>
<td>loc_fld3l</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
<tr>
<td>loc_fld3r</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>loc_fld4l</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
<tr>
<td>loc_fld4r</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information (e.g. state)</td>
</tr>
</tbody>
</table>
### Point Address Data

<table>
<thead>
<tr>
<th>I/CAD Column</th>
<th>Datatype</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>st_num</td>
<td>varchar2(15) / varchar(15)</td>
<td>House number</td>
</tr>
<tr>
<td>feanme</td>
<td>varchar2(30) / varchar(30)</td>
<td>Street name (without type)</td>
</tr>
<tr>
<td>featyp</td>
<td>varchar2(4) / varchar(4)</td>
<td>Street type</td>
</tr>
<tr>
<td>x_cord</td>
<td>number (10) / int</td>
<td>X coordinate</td>
</tr>
<tr>
<td>y_cord</td>
<td>number (10) / int</td>
<td>Y coordinate</td>
</tr>
<tr>
<td>mun</td>
<td>varchar2(40) / varchar(40)</td>
<td>Municipality</td>
</tr>
<tr>
<td>dirpre</td>
<td>varchar2(2) / varchar(2)</td>
<td>Street direction prefix (if used)</td>
</tr>
<tr>
<td>dirsuf</td>
<td>varchar2(2) / varchar(2)</td>
<td>Street direction suffix (if used)</td>
</tr>
<tr>
<td>lv_apt</td>
<td>varchar2(5) / varchar(5)</td>
<td>Apartment number</td>
</tr>
<tr>
<td>com_nme</td>
<td>varchar2(80) / varchar(80)</td>
<td>Business name or other common place-names, including aliases (if available) – may have multiple entries</td>
</tr>
<tr>
<td>lv_area</td>
<td>varchar2(40) / varchar(40)</td>
<td>Other area location information (e.g. state)</td>
</tr>
<tr>
<td>loc fld2</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information</td>
</tr>
<tr>
<td>loc fld3</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information</td>
</tr>
<tr>
<td>loc fld4</td>
<td>varchar2(5) / varchar(5)</td>
<td>Other location information</td>
</tr>
</tbody>
</table>
POLYGON FILE FORMAT

This appendix describes the use and format of the most prevalent type of polygon file used in the I/CAD environment. All I/CAD systems will require the creation of ESZ polygons, and many others will also use polygon files to associate other geographic data to the event information. In all cases the format of the polygon ASCII file (*.ply) will be the similar.

The ESZ polygon layer is used by the I/CAD system to determine an agency’s jurisdiction and deployment response to an incident. The ESZ polygon layer must be complete (i.e. no holes) and cohesive (no overlapping polygons allowed) – with each polygon having a unique numeric ESZ value. The associated ESZ value is derived using a point-in-polygon method (see below):

```
Point in Polygon method of deriving ESZ number
```

The following is a description of the ASCII files used to define the I/CAD Map polygon data. The format of this file lists the ESZ number and then the coordinates describing each polygon in turn. For non-ESZ polygons the ESZ: line will be replaced by a VALUE: line and is not restricted to numeric only values.

```
ESZ: 100  
VALUE: HWYC  
NUM: 335  
XY: 435339807 1484287819  
XY: 435401794 1484391980  
END
```

The “x,y co-ordinates” would list out until the polygon boundary is complete (the same number of lines as noted in the NUM field). The statement: END completes the boundary. This is repeated for each polygon defined for that area coverage.
I/CAD Map Specification

CAD Version 9.1

Security, Government & Infrastructure
INTRODUCTION

This document is meant as an overview of what map data is necessary to build an Intergraph Public Safety I/CAD system map. This document is meant for individuals and agencies with a basic background in cartography and/or GIS.

SUPPORTED DATA FORMATS

The following formats are natively supported:

1. ArcInfo
2. ArcView Shape
3. Computer Aided Design formats:
   a. MicroStation (V7, V8)
   b. AutoCAD (DWG, DXF)
4. FME**
5. FRAMME
6. GeoMedia SmartStore
7. Microsoft Access
8. MapInfo
9. MGE
10. ODBC
11. Oracle Spatial
12. SQL Server

** FME refers to all data source supported by Safe Software through its FME utility including ESRI Geodatabase. For a full list of these additional data sources please visit the Safe Software site: www.safe.com. Enabling FME supported data formats requires the additional purchase of the FME data server for GeoMedia.
MINIMUM REQUIRED DATA

- **Street Segments** – the street segments should be clean and topologically correct with attributes assigned as shown in the table structure described in the section below.
  
  - Tools for validating and cleaning the street segment data are provided with the GeoMedia Professional and I/Map Editor products
  
  - Street Segments need to be in a single feature class for the entire map.

- **Agency Beat Boundaries** – the beat/district boundaries should be polygon features with a unique numeric identifier as an attribute

- **Projection System** – I/Map Editor supports most projection systems and will perform dynamic coordinate system transformations if data sources have varying projections.

OPTIONAL DATA

- **Address Points (Special Addresses)** – street names need to be parsed out, clean (i.e. limited special characters and valid directions and types) and each address needs to be unique including the municipality and unit number fields.

- **Municipality Boundaries** – City, county and state boundaries.

- **Reference Features** – e.g. waterways, parks.

- **Common Names**– anything that could be referred to by other than address. For example, Wal-Mart parking lot or abandoned high school.

**NOTE:** cad does not consider uniqueness by x, y coordinates but by the address string itself (i.e. street number, unit number, name, type, directional suffix, and municipality). If no address is available, then the common name can be used as a unique identifier.

BOUNDARY/STREET SEGMENT INTERSECTION

If the boundary that meets a street is an agency deployment boundary there is no need to break the street segment. But if the boundary is a municipal or county boundary where attributes may change, then the street segment needs to be broken at the boundary.
DATABASE ATTRIBUTES

The street segment attributes need to have the equivalent of what is in the following table. The red attributes are usually necessary, the others are optional. I/Map Editor provides a field mapping utility allowing users to schema map source attributes to target attributes. Tools to add and transform attributes are also provided.

Changes to the schema that are new for CAD 9.1 are highlighted in yellow.

Centerline data

<table>
<thead>
<tr>
<th>Centerline Field</th>
<th>CAD Field</th>
<th>Data Type</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment Identifier</td>
<td>Segid</td>
<td>Number/Integer</td>
<td>10</td>
<td>Segment ID. A numeric values that uniquely identifies the segment.</td>
</tr>
<tr>
<td>Street Direction Prefix</td>
<td>Dirpre</td>
<td>Character</td>
<td>2</td>
<td>Direction Prefix. The direction prefix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Name</td>
<td>Feanme</td>
<td>Character</td>
<td>30</td>
<td>Feature Name. The name of the street.</td>
</tr>
<tr>
<td>Street Type</td>
<td>Featyp</td>
<td>Character</td>
<td>4</td>
<td>Feature Type. The feature type; for example, RD, AVE, or ST.</td>
</tr>
<tr>
<td>Street Direction Suffix</td>
<td>Dirsuf</td>
<td>Character</td>
<td>2</td>
<td>Direction Suffix. The direction suffix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Classification</td>
<td>Class</td>
<td>Character</td>
<td>12</td>
<td>Classification Code. The classification code of the segment describes the road type.</td>
</tr>
<tr>
<td>Address Range Type</td>
<td>Addtyp</td>
<td>Number/Integer</td>
<td>10</td>
<td>The address type code. If set to 0, the street addresses are odd on one side of the street and even on the other; if set to 1, the street addresses are contiguous; if set to 2, the street addresses are either odd or even on both sides of the street.</td>
</tr>
<tr>
<td>From Address Left</td>
<td>Fraddl</td>
<td>Character</td>
<td>11</td>
<td>From Address Left. Address at the “from” node on the left side of the segment.</td>
</tr>
<tr>
<td>From Address Right</td>
<td>Fraddr</td>
<td>Character</td>
<td>11</td>
<td>From Address Right. Address at the “from” node on the right side of the segment.</td>
</tr>
<tr>
<td>To Address Left</td>
<td>Toaddl</td>
<td>Character</td>
<td>11</td>
<td>To Address Right. Address at the “to” node on the left side of the segment.</td>
</tr>
<tr>
<td>To Address Right</td>
<td>Toaddr</td>
<td>Character</td>
<td>11</td>
<td>To Address Right. Address at the “to” node on the right side of the segment.</td>
</tr>
<tr>
<td>Municipality Left</td>
<td>Munl</td>
<td>Character</td>
<td>40</td>
<td>Left Municipality. The municipality in which the left side of the segment resides.</td>
</tr>
<tr>
<td>Municipality Right</td>
<td>Munr</td>
<td>Character</td>
<td>40</td>
<td>Right Municipality. The municipality in which the right side of the segment resides.</td>
</tr>
<tr>
<td>Postal Code Left</td>
<td>Zipl</td>
<td>Character</td>
<td>10</td>
<td>Zip Code on Left. The zip code in which the left side of the segment resides.</td>
</tr>
<tr>
<td>Postal Code Right</td>
<td>Zipr</td>
<td>Character</td>
<td>10</td>
<td>Zip Code on Right. The zip code on the right side of the segment.</td>
</tr>
<tr>
<td>Area Left</td>
<td>Areal</td>
<td>Character</td>
<td>40</td>
<td>Left Area. The area to the left of the street segment. Usually the community or subdivision.</td>
</tr>
<tr>
<td>Area Right</td>
<td>Arear</td>
<td>Character</td>
<td>40</td>
<td>Right Area. The area to the right of the street segment. Usually the community or subdivision.</td>
</tr>
<tr>
<td>Location2 Left</td>
<td>Loc_fld2l</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually the county name.</td>
</tr>
<tr>
<td>Location2 Right</td>
<td>Loc_fld2r</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually the county name.</td>
</tr>
<tr>
<td>Location3 Left</td>
<td>Loc_fld3l</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually the State name.</td>
</tr>
<tr>
<td>Location3 Right</td>
<td>Loc_fld3r</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually the State name.</td>
</tr>
</tbody>
</table>
### I/CAD MAP SPECIFICATION

<table>
<thead>
<tr>
<th>Location Left</th>
<th>Loc_fld4l</th>
<th>Character</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Loc_fld4l</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Custom defined</td>
</tr>
<tr>
<td>Right</td>
<td>Loc_fld4r</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Custom defined</td>
</tr>
</tbody>
</table>

| Left Emergency Service Zone (ESZ) | Long | Left Emergency Service Zone (ESZ) in which the left side of the street segment resides. Not necessary if ESZ polygons are correct. |
| Right Emergency Service Zone (ESZ) | Long | Right Emergency Service Zone (ESZ) in which the right side of the street segment resides. Not necessary if ESZ polygons are correct. |
| Speed Limit          | Speedlimit | double | Maximum speed a vehicle may legally travel along street segment. |
| Risk Cost            | Riskcost  | double | Assigned value indicating the risk involved traversing the street segment. For example, there is more risk traversing a street with an elementary school than there is traversing a country road. |
| Time Factor          | Timefactor | double | Factor applied to time cost at certain times of day. For example, at 3:00 p.m., it may take twice as long as normal to traverse the segment. |
| Height Limit         | Height    | double | Maximum vehicle height street segment can accommodate. |
| Weight Limit         | Weight    | double | Maximum vehicle weight the street segment can sustain. |
| Width Limit          | Width     | double | Maximum vehicle width the street segment can accommodate. |
| One-Way Flag         | Blockage_mask | Long (Character for one-way flag) | The Blockage Mask contains information about impediments to forward progress at both ends of the street segment. A One-Way Flag may be submitted consisting of “FT” for traffic going the digitized direction, “TF” for traffic in the opposite direction, and a null value for two-way traffic. The flag value will be translated to the blockage mask. |
| Obstacle Mask        | Obstacle_mask | Short | Information describing obstacles that delay, but do not completely impede, forward progress at the begin and/or end node of the street segment. |
| Turn Mask            | Turn_mask | Short | Information describing limitations on forward progress at both begin and end nodes of the street segment. |
| From node Z level    | Frzlev    | short | Elevation level at the “from” node. The acceptable range is -10 to 10. |
| To node Z level      | Tozlev    | short | Elevation level at the “to” node. The acceptable range is -10 to 10. |

### Street Aliases (Optional):

<table>
<thead>
<tr>
<th>Alias Field</th>
<th>CAD Field</th>
<th>Data Type</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment Unique ID</td>
<td>Segid</td>
<td>Number/Integer</td>
<td>10</td>
<td>Segment ID.</td>
</tr>
<tr>
<td>Direction Prefix</td>
<td>Dirpre</td>
<td>Character</td>
<td>2</td>
<td>Direction Prefix. The direction prefix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Name</td>
<td>Feaname</td>
<td>Character</td>
<td>30</td>
<td>Feature Name. The name of the street.</td>
</tr>
<tr>
<td>Street Type</td>
<td>Featyp</td>
<td>Character</td>
<td>4</td>
<td>Feature Type. The feature type; for example, RD, AVE, or ST.</td>
</tr>
<tr>
<td>Street Direction Suffix</td>
<td>Dirsuffix</td>
<td>Character</td>
<td>2</td>
<td>Direction Suffix. The direction suffix (N, NW, SE, and so on).</td>
</tr>
</tbody>
</table>
## Point Addresses:

<table>
<thead>
<tr>
<th>Address Field</th>
<th>CAD Field</th>
<th>Data Type</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address ID</td>
<td>Mslink</td>
<td>Number/Integer</td>
<td>10</td>
<td>A numeric value that uniquely identifies the address point.</td>
</tr>
<tr>
<td>Street Direction Prefix</td>
<td>Dirpre</td>
<td>Character</td>
<td>2</td>
<td>Direction Prefix. The direction prefix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Name</td>
<td>Feanme</td>
<td>Character</td>
<td>30</td>
<td>Feature Name. The name of the street.</td>
</tr>
<tr>
<td>Street Type</td>
<td>Featyp</td>
<td>Character</td>
<td>4</td>
<td>Feature Type. The feature type; for example, road or street.</td>
</tr>
<tr>
<td>Street Direction Suffix</td>
<td>Dirsuf</td>
<td>Character</td>
<td>2</td>
<td>Direction Suffix. The direction suffix, N, NW, SE, and so on.</td>
</tr>
<tr>
<td>Street Number</td>
<td>St_num</td>
<td>Character</td>
<td>15</td>
<td>Street Number. The street number of the special address.</td>
</tr>
<tr>
<td>Apartment Number</td>
<td>Lv_apt</td>
<td>Character</td>
<td>5</td>
<td>Apartment Number. The apartment number or suite number of the special address.</td>
</tr>
<tr>
<td>Area</td>
<td>Lv_area</td>
<td>Character</td>
<td>40</td>
<td>Area Indicator. The area value for the special address.</td>
</tr>
<tr>
<td>Municipality</td>
<td>Mun</td>
<td>Character</td>
<td>40</td>
<td>Municipality. The municipality of the special address.</td>
</tr>
<tr>
<td>Location1</td>
<td>Loc_fld1</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually a building number.</td>
</tr>
<tr>
<td>Location2</td>
<td>Loc_fld2</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually a county name.</td>
</tr>
<tr>
<td>Location3</td>
<td>Loc_fld3</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually a state name.</td>
</tr>
<tr>
<td>Location4</td>
<td>Loc_fld4</td>
<td>Character</td>
<td>5</td>
<td>Generic location field.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Com_nme</td>
<td>Character</td>
<td>80</td>
<td>Common Place Name. The name of a common place defined for the CAD Location Verify command.</td>
</tr>
<tr>
<td>Feature Class Code</td>
<td>Fcode</td>
<td>Character</td>
<td>12</td>
<td>Finds the symbol to place for each special address record. The Fcode value must have a corresponding netfea record (with the same Fcode), which defines the fcode's symbol.</td>
</tr>
<tr>
<td>Message</td>
<td>Msg</td>
<td>Character</td>
<td>unlimited</td>
<td>Message about the common place or special address. Will appear in all events.</td>
</tr>
</tbody>
</table>
Common Place Names or Point Aliases(Optional):

<table>
<thead>
<tr>
<th>Common Name Field</th>
<th>CAD Field</th>
<th>Data Type</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Direction Prefix</td>
<td>Dirpre</td>
<td>Character</td>
<td>2</td>
<td>Direction Prefix. The direction prefix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Name</td>
<td>Feanme</td>
<td>Character</td>
<td>30</td>
<td>Feature Name. The name of the street.</td>
</tr>
<tr>
<td>Street Type</td>
<td>Featyp</td>
<td>Character</td>
<td>4</td>
<td>Feature Type. The feature type; for example, RD, AVE, or ST.</td>
</tr>
<tr>
<td>Street Direction Suffix</td>
<td>Dirsuf</td>
<td>Character</td>
<td>2</td>
<td>Direction Suffix. The direction suffix (N, NW, SE, and so on).</td>
</tr>
<tr>
<td>Street Number</td>
<td>St_num</td>
<td>Character</td>
<td>15</td>
<td>Street Number. The street number of the special address.</td>
</tr>
<tr>
<td>Apartment Number</td>
<td>Lv-apt</td>
<td>Character</td>
<td>5</td>
<td>Apartment Number. The apartment number or suite number of the special address.</td>
</tr>
<tr>
<td>Area</td>
<td>Lv_area</td>
<td>Character</td>
<td>40</td>
<td>Apartment Number. The apartment number or suite number of the special address.</td>
</tr>
<tr>
<td>Municipality</td>
<td>Mun</td>
<td>Character</td>
<td>40</td>
<td>Municipality. The municipality of the special address.</td>
</tr>
<tr>
<td>Location1</td>
<td>Loc_fld1</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually building number.</td>
</tr>
<tr>
<td>Location2</td>
<td>Loc_fld2</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually county name.</td>
</tr>
<tr>
<td>Location3</td>
<td>Loc_fld3</td>
<td>Character</td>
<td>5</td>
<td>Generic location field. Usually State name</td>
</tr>
<tr>
<td>Location4</td>
<td>Loc_fld4</td>
<td>Character</td>
<td>5</td>
<td>Generic location field.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Com_nme</td>
<td>Character</td>
<td>80</td>
<td>Common Place Name. The name of a common place defined for the CAD Location Verify command.</td>
</tr>
<tr>
<td>Message</td>
<td>Msg</td>
<td>Character</td>
<td>Unlimited</td>
<td>Message. A message about the common place or special address.</td>
</tr>
</tbody>
</table>
Statement of Work
For Maricopa County
Public Safety Geofile Evaluation
Reference: Serial 11086 – RFP REQUEST FOR PROPOSAL:
CAD/RMS/CIVIL PROCESS and MOBILE SYSTEMS

Prepared: 1/26/2012
January 26, 2012

Beverly Allen, PMP
Public Safety Sales Support
Security, Government & Infrastructure (SG&I) Division
Intergraph Corporation
P.O. Box 240000
Mailstop 17B-108D
19 Interpro Road
Huntsville, AL 35813 USA

SUBJECT: Geofile Evaluation Services

Dear Beverly:

GIS Data Resources, Inc. (GDR) is pleased to present a Statement of Work (SOW) to Intergraph Corporation to evaluate the current accuracy and completeness of Maricopa County, Arizona’s Public Safety GIS & Addressing Datasets.

For this project, GDR will conduct a comprehensive data evaluation on a variety of tabular and geospatial addressing datasets provided by Maricopa County to determine its compliance with the latest National Emergency Number Association (NENA) guidelines, as well as requirements for Intergraph’s public safety solutions. Depending on the datasets submitted for review, over 120 separate data attributes and attribute combinations will be evaluated by GDR using our ProManage system.

The summary results of our findings will be documented in a formal written report and WebEx presentation for both Intergraph and Maricopa County.

Following receipt of our SOW, should you have any questions or comments, please contact me at your earliest convenience at (916) 749-5010 or via email at greg.spadorcio@gdr.com.

Sincerely,

Greg Spadorcio
Vice President of Operations
GIS Data Resources, Inc.

cc: Tony Alex
    Roy Jackson
    Mark Roylance – Intergraph
STATEMENT OF WORK

Overview

GIS Data Resources GDR will conduct a comprehensive review of current Maricopa County, Arizona public safety GIS and tabular addressing datasets using our ProManage system to determine accuracy and completeness with the latest National Emergency Number Association (NENA) guidelines, as well as additional GDR data source comparisons. Depending on the datasets submitted for evaluation, over 120 separate data attributes and attribute combinations will be evaluated. The table below identifies the data source comparisons that GDR will perform as part of the Data Evaluation process; assuming Maricopa County has provided the data elements:

<table>
<thead>
<tr>
<th>Data Source Comparison Matrix</th>
<th>Street Centerlines</th>
<th>Address Points</th>
<th>MSAG</th>
<th>ALI</th>
<th>Emergency Service Zones</th>
<th>MSAG Communities</th>
<th>City Boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Centerlines</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Address Points</td>
<td>✗</td>
<td></td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>MSAG</td>
<td>✗</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>ALI</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Emergency Service Zones</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>MSAG Communities</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>City Boundaries</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>
Data Review Process

There are three key steps to our Geofile Evaluation process: Data Aggregation, Data Review, and Reporting of Findings. The chart below outlines the process that GDR will follow for conducting the evaluation of Maricopa County data.

Data Aggregation

GDR will review the data from the county for completeness, perform a series of initial tests on the datasets, load the data into the review database, and standardize the data in preparation for analysis. To run a NENA complaint evaluation, the datasets below are required; however the datasets in *italics* are optional, but highly recommended:

- **Street Centerlines** – Current street centerline file with street names, left / right address ranges, routing information (if available), and city/community values
- **MSAG** – Master Street Address Guide – this is a comprehensive list of street names, address ranges, and community / emergency service numbers used for 911 call routing. Any unique naming conventions used should be described.
- **Municipality / Jurisdictional Boundaries** – Areas that define the edges of a jurisdiction / municipality, which typically relate to the emergency response boundaries.

- **Parcels / Address Points** – Point addresses or property boundaries having address numbers, street names, and city values.

- **Emergency Service Zones** – The areas that define unique service requirements for police, fire, EMS, and law agencies.

- **Common Place Locations** – A list of common place names, such as the City Hall, with corresponding street address listing.

- **ALI** – Automatic Location Identification database - this is a list of addresses of active phone customers.

- **Additional GIS Related Data** – Any additional data the County currently uses within its public safety GIS (e.g., Building Footprints, Hydrants, Water Polygons, Rivers, Interstates / Freeways / Highways).

In addition to the above datasets, it is crucial that the agency complete the Pre-Evaluation Questionnaire that GDR will provide to the County. This information enables GDR to properly assess the County data and provide accurate deliverables.

Once the current data and the questionnaire have been submitted, GDR conducts a brief evaluation of the data and schedules an initial conference call to discuss further specifications and requirements of the data evaluation. During this call, the teams may discuss the definition of the agency service area, known addressing patterns, known data issues, and anything else found during the assessment of the data.

### Data Analysis

Following receipt of all available datasets, GDR will conduct a comprehensive analysis using its ProManage system to determine the County’s compliance with the latest NENA guidance (NENA Information Document for Synchronizing Geographic Information System databases with MSAG & ALI, NENA 71-501, Version 1.1, September 8, 2009), generally accepted standards for public safety grade datasets, and requirements for the Intergraph CAD solution.

The overall goal is to determine the accuracy and completeness of the data, and to identify specific errors or inconsistencies that may impact public safety application performance. During the Data Analysis phase, the following questions are explored:

- What problems that are common to Addressing datasets are found in the data?
How could these problems negatively affect CAD performance, including Routing, Response Recommendations, and Reporting?

How well does the data adhere to best practices for data quality as described by the NENA guidance document?

While considering the above questions, GDR’s expert analysts will utilize the ProManage system as well as many others tools to conduct pattern analysis, cross-dataset consistency checks, NENA quality analysis, and identify errors in the data. Fundamentally, GDR is looking for the following issues:

- Spatial/topological accuracy
- Attribute consistency and adherence to NENA data standards
- Cross-dataset consistency conflicts, comparing streets, address points, MSAG, ALI, and other data to identify discrepancies

### Reporting of Findings

Based on the results of the Data Analysis, GDR will provide a written report that summarizes the overall evaluation results along with statistics of the errors identified (counts and types of errors), representative screen shots of recognized errors in the dataset, and recommendations for improvement on the dataset. The written document includes the follow elements (assuming all data was provided to GDR for analysis):

- Data Evaluation Overview
- Source Data and Analysis Information
- Data Evaluation Summaries (Graph and Tables of Results)
- Street Centerline Topology Analysis Summary
- Street Centerline Address Range Analysis Summary
- Street Centerline Parity Analysis Summary
- Street Centerline Routing Analysis Summary
- Street Centerlines vs. MSAG, MSAG vs. Street Centerlines Analysis Summary
- Address Points Verification Analysis Summary
- ALI Verification Analysis Summary
- Common Place Verification Analysis Summary
- Polygon Verification Analysis Summary
- No Hits List Summary
Please note: complete lists of errors and discrepancies are not provided, however summaries and counts of the errors by type along with specific examples will be provided in the Geofile Evaluation Report.

Following delivery of the Geofile Evaluation Report, GDR will provide a formal presentation (via WebEx) to identify and discuss the data format conversions or corrections necessary to eliminate errors/inconsistencies. As part of the presentation GDR will describe how we conducted the analysis, what we found, and what steps will be necessary to correct the data.

**Cost Proposal and SOW**

After the WebEx, GDR will provide a formal cost proposal and SOW to provide the services necessary for the County to achieve its accuracy and completeness goals consistent with NENA guidelines and the desired services from the County.

**Schedule**

A deliverable schedule for the Geofile Evaluation project is described below:

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Days Following Contract Signing and Receipt of All Data Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery of Geofile Evaluation</td>
<td>15 calendar days from receipt of all datasets</td>
</tr>
<tr>
<td>Cost Proposal and SOW</td>
<td>3 calendar days following WebEx presentation</td>
</tr>
</tbody>
</table>
February 6, 2012

Beverly Allen, PMP
Public Safety Sales Support
Security, Government & Infrastructure (SG&I) Division
Intergraph Corporation
19 Interpro Road
Huntsville, AL 35813

Dear Beverly,

GIS Data Resources, Inc. (GDR) is pleased to present the Preliminary Data Evaluation for the Maricopa County’s Sheriff Office (MSCO) GIS datasets. This evaluation focused on evaluating the GIS datasets MCSO provided to GDR, including multiple street files, address point files, boundary files, as well as additional layers. These datasets have been evaluated with the understanding that the MCSO desires to build one street centerline file, one address point file, one city boundary file, and one law boundary file; as well clean up any other layers for optimal utilization in the Intergraph CAD system.

In summary, GDR has found the MCSO datasets will need additional work to meet the established 98% accuracy guidance established by NENA. A bar graph summary of individual errors by category is depicted below for the MCSO Service Area only, as well as descriptions of errors and example screen shots of errors in the data. It should be noted that considerable effort was made to standardize the supplied data before any comparisons were made so as to avoid any erroneous error counts in the data.

Errors by Category for MCSO Service Area

![Bar graph showing errors by category for MCSO Service Area](image_url)
Findings and Recommendations:

During the course of the evaluation, GDR noted the following:

- There are three different street centerline files provided by MSCO that should be used to build a single file. For this evaluation, GDR examined the conflicts and missing geometry between the street centerlines from Maricopa County Sheriff’s Office, Public Works, and Phoenix Regional 911.

- For the street centerline file, all routing attributes (i.e., FCC, speed, one-way, elevations) will need to be built since there was limited attribute information available in the data submitted.

- There are two address point files provided by MSCO that should be used to build a single file. For this evaluation, GDR examined the unique addresses from the Elections Department point file and the Phoenix Regional 911 point file.

- Based on the ESZ boundary file from the Phoenix Fire Department, there are many areas that are served by the Maricopa County Sheriff’s Office and many that are served by the local jurisdiction. For this evaluation, GDR considered both types of areas in order to understand each level of effort.

GDR’s evaluation includes, but is not limited to, a detailed analysis of each item above. To illustrate some of the issues, screenshots of some error types are included in the pages following. It is important to note that the examples in this document only display a sample of error types that GDR evaluates.

STREET CENTERLINE GEOMETRY AND ATTRIBUTES: COMPARE TO REFERENCES

Based on a comparison between the Maricopa County Sheriff’s Office (MCSO) street centerlines and the Public Works (PW) street centerlines, GDR identified many naming conflicts as well as many segments missing from the MCSO file. GDR has also conducted an identical analysis between the MCSO street centerlines and the Phoenix Regional 911 street centerlines. The following examples are all located in Maricopa County Sheriff’s Office response zones.

The screenshot to the right is an example of where the MCSO file calls the segment E TOMBSTONE AVE while the PW file calls the segment E LASER DR. This street is located in FTN HILLS. In order to correct and/or verify this situation, GDR will consider all three street centerline files, all surrounding address points, the MSAG, USPS data, and orthoimagery.
The screenshots below are examples of where the MCSO file does not contain a group of segments, while the Public Works file (red segments) has accurate geometry and attribution. The screenshot on the left is N BALERA DR in FNT HILLS and the screenshot on the right is CAMDEN SIERRA in PEORIA. In order to correct these situations, GDR will import all such centerlines and verify the geometry and attribution based on all street centerlines files, all surrounding address points, the MSAG, USPS data, and orthoimagery.

STREET CENTERLINE GEOMETRY AND ATTRIBUTES: RANGE ERRORS

GDR has identified many segment pairs that overlap on range. This is a crucial problem in CAD during emergency response, especially if the overlapping segments are far from each other. In the screenshot to the right, N BRETT ST in GILBERT appears to have many range overlaps. In this case, there is a segment to the far left and another to the far right that are selected, which have a range overlap at 159-163. You should also notice that the segment to the far left may also overlap on range with many of the segments in between. In order to correct this situation, GDR will consider all street centerline references, surrounding address points, USPS
data, the MSAG, and imagery to determine and verify the correct range attribution for all street centerlines involved.

**STREET CENTERLINE GEOMETRY: TOPOLOGY ERRORS**

GDR has identified many topology errors within the MCSO street centerlines. One of these error types is called a dangle, where two segments should be connected but are not. In the screenshot to the right, the on ramp is not connected to the freeway, thus routing will not function in CAD. In order to correct this situation, GDR will identify and correct all such examples, as well as other types of topology errors.

**STREET CENTERLINE ROUTING: ELEVATION ERRORS**

GDR has evaluated the routing accuracy for the MCSO street centerlines and has found a significant level of work necessary to accomplish optimal CAD functionality. For the Intergraph CAD system, FCC and speed values will need to be built into the data. In addition, one-way values and elevations must be considered for routing near freeways. Currently, there are no such attributes in the provided data.

In the screenshot below, the freeway segments and the non-freeway segments are currently split at the overpass / underpass intersection. Since elevation attributes are not currently in the data, emergency vehicle routing would be compromised since the current data suggest you could route from the freeway down to the road underneath. In order to correct this situation, either merging the freeway segments to disallow routing to the road below, or elevation attributes will need to be added to the data.
ADDRESS POINT ERRORS

GDR has evaluated all unique address points from the Elections Department point file and the Phoenix Regional 911 points. The points are compared to the street centerlines on naming, zones, and range values, and are also compared to the MSAG.

In the screenshot below, 44844 N SHANGRI LN matches the current street centerline on all naming fields. However, the address point is not within the block range for the associated segment, which ends at 44834. In order to correct this situation, several data sources will need to be considered such as street centerlines, the MSAG, USPS data, and imagery to extend the street centerline range without creating additional errors.

MSAG ERRORS

GDR has evaluated all MSAG records by identifying all individual MSAG 100 blocks and comparing them to the current street centerlines, address points, and USPS data. If an MSAG range block is validated by an address point or USPS data but the full range does not exist in the current street centerlines, GDR identifies this as an error in the data.

In the screenshots below, the segments of N MORNINGSTAR LN stops in the 26800 block. The MSAG has a high range ending in the 27200 block. Since there are address points in the 27000 block (see screenshot), the street centerline and/or MSAG needs to be corrected. In order to correct this situation, several data sources will need to be considered such street centerlines, surrounding address points, similar MSAG records, USPS data, and imagery to determine the correct range values for the street centerlines and the MSAG.
MARICOPA COUNTY DATA

For the Data Evaluation, GDR evaluated all datasets provided by MCSO which encompassed the entire County of Maricopa. The data was broken into two categories, “All of Maricopa County” and “MCSO Service Area”. In defining the MCSO service area, GDR included all ESN polygons that have a PSAP or a Police Department of MCSO. This was based on the polygon attributes from the ESN layer maintained by the Phoenix FD. To the right is a screenshot of the MCSO jurisdiction polygons, which are represented in blue:
The bar chart below, displays the errors for all of Maricopa County as found within the data provided by MCSO:

### Errors by Category for Maricopa County

<table>
<thead>
<tr>
<th>Category</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Street Attribution Errors</td>
<td>13,439</td>
</tr>
<tr>
<td>Total Street Topology Errors</td>
<td>5,024</td>
</tr>
<tr>
<td>Total Street Address Range Errors</td>
<td>16,926</td>
</tr>
<tr>
<td>Total Addresspoint Errors</td>
<td>43,890</td>
</tr>
<tr>
<td>Total MSAG vs. Street Name Errors</td>
<td>8,507</td>
</tr>
<tr>
<td>Total MSAG 100 Blocks Missing From Streets</td>
<td>?</td>
</tr>
</tbody>
</table>

### RECOMMENDED ACTIONS

It is GDR’s recommendation that for the MCSO Service Area, Street Centerlines and MSAG records should be synchronized to minimize discrepancies between the different datasets. Secondly, all overlap and parity errors should be corrected. GDR recommends a complete build of Address Points for primary geocoding with the addition of Segment Routing attributes to take full advantage of the capabilities of the Intergraph CAD environment. Finally, It is also recommended that Boundary Enhancement services be performed to ensure emergency response and communities layers are accurate.

### GDR Services

<table>
<thead>
<tr>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>NENA Compliant Synchronization / Build</td>
<td>Needed</td>
</tr>
<tr>
<td>Options:</td>
<td></td>
</tr>
<tr>
<td>Segment Routing</td>
<td>Recommended</td>
</tr>
<tr>
<td>Address Points Synchronization</td>
<td>Recommended</td>
</tr>
<tr>
<td>Boundary Enhancement</td>
<td>Recommended</td>
</tr>
<tr>
<td>Common Place</td>
<td>Recommended</td>
</tr>
<tr>
<td>Mileposts</td>
<td>Optional</td>
</tr>
<tr>
<td>Auxiliary Layers</td>
<td>Optional</td>
</tr>
</tbody>
</table>
The GDR NENA Compliant Synchronization / Build include the following services:

- Project initiation and delivery
- Naming Standardization in accordance with NENA Guidance
- Street Centerline Addressing and Geometry
- Street Centerline and MSAG Synchronization
- Implementing client feedback requests based on local knowledge

On behalf of everyone at GDR, we appreciate the opportunity to provide Maricopa County Sheriff's Office with this Preliminary Data Evaluation. Please let me know if you have any questions. We look forward to speaking with you soon.

Sincerely,

Tony Alex
Executive Vice President - Business Development
GIS Data Resources, Inc.
Maricopa County Data Evaluation Summary

MCSO Service Area Only:

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Features Analyzed</th>
<th>Anomaly Count</th>
<th>Anomaly %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attribution Errors</td>
<td>41,000</td>
<td>3,127</td>
<td>7.6%</td>
</tr>
<tr>
<td>Address Range Errors</td>
<td>41,000</td>
<td>3,455</td>
<td>8.4%</td>
</tr>
<tr>
<td>Unique Source Records</td>
<td>41,000</td>
<td>6,582</td>
<td>16.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Features Analyzed</th>
<th>Anomaly Count</th>
<th>Anomaly %</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSAG/Street Errors</td>
<td>11,359</td>
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<td>Unique Source Records</td>
<td>52,359</td>
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<tr>
<td>MSAG 100 Block Errors</td>
<td>50,129</td>
<td>2,618</td>
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*11,359 represent the total number of MSAG records and not blocks. There are 50,129 individual blocks for the MCSO Jurisdiction area.

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<th>Feature Type</th>
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<tr>
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<th>Features Analyzed</th>
<th>Anomaly Count</th>
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<tbody>
<tr>
<td>Topology Errors (entire county)</td>
<td>265,952</td>
<td>5,024</td>
<td>1.9%</td>
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</tbody>
</table>
NENA INFORMATION DOCUMENT

NOTICE
This NENA Information Document is published by the National Emergency Number Association (NENA) as an information source for the voluntary use of communication centers and other interested parties and is provided as an example only. It is not intended to be a complete directive.

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NENA’s Joint Data Technical/PSAP Operations & Next Generation Integration Committees have developed this document. Recommendations for changes to this document may be submitted via email to CommLeadership@nena.org or via mail to:

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4350 North Fairfax Drive
Suite 750
Arlington, VA 22203-1695
800-332-3911
Acknowledgments:

This document has been developed by the National Emergency Number Association (NENA) Joint Data Technical/PSAP Operations & Next Generation Integration Committees, Next Generation Data Development Working Group. The following individuals are recognized for their contributions in development of this document.

<table>
<thead>
<tr>
<th>Members:</th>
<th>Company/Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marc Berryman, ENP – PONGI Vice-Chair</td>
<td>Greater Harris County 9-1-1</td>
</tr>
<tr>
<td>Erica Aubut, ENP – DTC Vice-Chair</td>
<td>State of Vermont 9-1-1</td>
</tr>
<tr>
<td>Anthony Haddad</td>
<td>Contact One, Inc.</td>
</tr>
<tr>
<td>Bob Long, GISP</td>
<td>Bexar Metro 9-1-1 District</td>
</tr>
<tr>
<td>Brett Schneider, ENP</td>
<td>Bexar Metro 9-1-1 District</td>
</tr>
<tr>
<td>Carlton B Walls III, ENP</td>
<td>Lancaster County-Wide Communications</td>
</tr>
<tr>
<td>Chiu-Wen Ray</td>
<td>Montgomery County 9-1-1 District</td>
</tr>
<tr>
<td>Gordon Chinander, GISP</td>
<td>Metropolitan Emergency Services Board</td>
</tr>
<tr>
<td>Ilyanna Kadich</td>
<td>CAPCOG</td>
</tr>
<tr>
<td>Ira Pyles, ENP</td>
<td>Hillsborough County 911</td>
</tr>
<tr>
<td>Jan Funderburgh</td>
<td>Smith County 9-1-1 District</td>
</tr>
<tr>
<td>Jeanne Frey</td>
<td>Montgomery County 9-1-1 District</td>
</tr>
<tr>
<td>Jim Kringle</td>
<td>Lubbock Emergency Communication District</td>
</tr>
<tr>
<td>Kathy Liljequist, GISP</td>
<td>GeoComm, Inc</td>
</tr>
<tr>
<td>Matt Francis</td>
<td>North Central Texas Council of Governments</td>
</tr>
<tr>
<td>Monica Watt</td>
<td>Texas CSEC</td>
</tr>
<tr>
<td>Phillip Rohrbough</td>
<td>Tarrant County 9-1-1 District</td>
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<tr>
<td>Rachel Kilby</td>
<td>Guilford Metro 911</td>
</tr>
<tr>
<td>Rebecca Stoneman</td>
<td>Houston Galveston Area Council of Governments</td>
</tr>
<tr>
<td>Tommy Keesee</td>
<td>Nortex Regional Planning Commission</td>
</tr>
<tr>
<td>Vonda Gafford</td>
<td>Midland Emergency Communication District</td>
</tr>
<tr>
<td>Vonda Payne</td>
<td>Texas CSEC</td>
</tr>
<tr>
<td>Yui Skulpoonkitti, GISP, ENP</td>
<td>Tarrant County 9-1-1 District</td>
</tr>
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</table>
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1 Executive Overview
This document is the NENA information document for the synchronization of certain Geographic Information Systems (GIS) database layers with the Master Street Address Guide, the Automatic Location Information data, and optionally the site / structure locations. This document is meant to provide PSAP management, vendors, and other interested parties necessary guidelines for synchronizing GIS data with existing 9-1-1 databases. The synchronization process of the GIS data is most reliably accomplished by qualified, trained individuals or vendors that have received formal GIS training and instruction.

2 Introduction

2.1 Purpose and Scope of Document
This document is provided as a guide to synchronizing both the Master Street Address Guide (MSAG) and optionally the Automatic Location Information (ALI) databases to a Geographic Information System (GIS) geospatial database of road centerlines, site / structure locations, and related spatial databases. One must have a basic understanding of GIS concepts and MSAG data, or the resources available, in order to understand this document. The preferred method for performing the synchronization is using various database techniques. Emergency Service Zones, MSAG and Postal Community Names, and optionally the ALI data and address point data will all be used in the synchronization process. The synchronization of these databases will improve the accuracy of the GIS data, the MSAG, and optionally the ALI data, aid in meeting the requirements for Next Generation 9-1-1 (NG9-1-1) and improve the accuracy of the GIS data for Public Safety Answering Point (PSAP) map display for all types of calls. Once the corrections are made, the GIS road centerline file can then be used to validate addressing and to generate an up-to-date MSAG file for scrubbing service provider addresses.

2.2 Reason to Implement
Accurate and current data is of paramount importance to 9-1-1 entities. Having MSAG, ALI, and GIS datasets in agreement is crucial to providing telecommunicators the information they need to correctly verify the location of a caller and provide proper emergency response. Developing common datasets that follow a single standard will provide critical information to the PSAP and emergency responders and facilitate local, regional, and nationwide exchanging of data and information. As today’s technology transitions to meet tomorrow’s needs, the need for following a single set of standards is essential.

Comparing the MSAG and GIS databases will identify inconsistent naming conventions, inaccurate address information, improper ESN assignments to MSAG records, improper community assignments, improper exchange designations, and other discrepancies. The comparison process will also reveal fictitious data, incomplete information, and data that exist in only one database. It is important to note that errors or missing information can exist in both databases and other sources should be consulted as well to improve the overall accuracy and completeness of the data.
2.3 Document Terminology

The terms "shall", "must" and "required" are used throughout this document to indicate required parameters and to differentiate from those parameters that are recommendations. Recommendations are identified by the words "desirable" or "preferably".

2.4 Reason for Reissue

NENA reserves the right to modify this document. Upon revision, the reason(s) will be provided in the table below.

<table>
<thead>
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<th>Version</th>
<th>Approval Date</th>
<th>Reason For Changes</th>
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<tr>
<td>Original</td>
<td>05/26/2009</td>
<td>Initial Document</td>
</tr>
<tr>
<td>1.1</td>
<td>08/19/2009</td>
<td>Document number changed to 71-501</td>
</tr>
</tbody>
</table>

2.5 Recommendation for Standards Development Work

This document references existing NENA Standards and no further standards work is required at this time.

2.6 Cost Factors

Some of the cost factors to be considered, when undertaking the synchronization process, may include:

- Additional personnel
- Overtime
- Software
- Hardware
- Training (including seminars, conferences, webinars, podcast)
- Consultants
- Stress Management Classes
- Meetings among those involved
- Data availability
- Accuracy and completeness of existing data

2.7 Acronyms/Abbreviations/Definitions

Some acronyms/abbreviations used in this document have not yet been included in the master glossary. After initial approval of this document, they will be included. See NENA 00-001 - NENA Master Glossary of 9-1-1 Terminology located on the NENA web site for a complete listing of terms used in NENA documents.

The following Acronyms/Abbreviations are used in this document:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
</table>
| ALI     | Automatic Location Identification       | **N)ew** **(U)date**
The following Acronyms/Abbreviations are used in this document:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANI</td>
<td>Automatic Number Identification</td>
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### 3 Synchronization of GIS, MSAG, and ALI data

Conflicting information between the MSAG, ALI and GIS databases becomes more prevalent without a constant effort to keep the systems synchronized. However, GIS data of any size will contain errors, and eliminating them all is an unrealistic expectation. The goal of this document is to develop a process that will consistently identify errors or discrepancies in the data and quickly correct those which are found. The longer GIS data goes without an update, the less accurate the information will become and the integrity of the data diminishes. The 9-1-1 Authority will always be the responsible party for the data, whether they use in-house staff to produce the data or obtain it from:

- Local GIS department(s) (i.e. government, law enforcement, fire department, utilities)
- Local City or County GIS departments
- Mapping Vendor
- GIS data provided from third parties
- The Addressing Authority(ies)

The amount of time to correct the data and eliminate errors cannot be estimated until an analysis of the discrepancies is performed. Maintaining data integrity within the GIS, MSAG, and ALI requires high levels of coordination to resolve discrepancies. Synchronization of the MSAG, ALI, and GIS data requires coordination between the 9-1-1 Governing Authority database personnel, GIS personnel, Database Management Systems (DBMS), Postal Authority, the local Addressing Authority, Incumbent Local Exchange Carriers (ILEC’s) and Competitive Local Exchange Carriers (CLEC’s). This process requires specific procedures and a clear process to keep the information synchronized. It is important that the users of map data retain confidence in the data’s accuracy. All GIS, MSAG, and ALI data must be continuously updated with the newest information and the updates made available to telecommunicators in a timely manner.

- The GIS and MSAG database synchronization process involves many important steps that are explained in detail throughout this document. Traditionally these two databases have been maintained separately; therefore understanding the current condition and maintenance processes of these existing databases is the important first step towards synchronization. From this understanding, an agency specific workflow can be implemented to consolidate and standardize the MSAG and GIS data. Once the MSAG and GIS databases are standardized, they need to be compared for accuracy and completeness. The synchronization of the GIS and the MSAG data could ultimately lead to a consolidated workflow and data maintenance process which would eliminate the need to maintain separate GIS and MSAG databases.

The basic steps in the synchronization process for GIS, MSAG, and optionally ALI data can be broken down into:

- Data Preparation

Version 1.1, September 8, 2009
• Data Standardization
• Initial Corrections to the Databases
• Synchronization
• Discrepancy Reports
• Discrepancy Corrections
• Maintenance – The synchronization and correction of discrepancies should be done on a continuous basis.

As neither database is static in nature, the synchronization process will never yield a 100 percent match rate. The information in this document should be part of an ongoing and continuous process to ensure that the databases remain current and synchronized.

• It is recommended that a minimum match rate of 98% be set prior to using the GIS data in the Emergency Routing Data Base (ERDB) or the Location to Service Translation (LoST) Protocol services.

There are many possible types of discrepancies and they all require research to find the resolutions that properly represent reality. Once this process is complete, the result is a consolidated, accurate, and complete 9-1-1 GIS database that is the central maintenance repository for addressing, mapping, and 9-1-1 database reporting.

3.1 Data Preparation

Standardization and quality control processing must take place on the GIS street centerline data and the MSAG data prior to comparing the two data sets for the synchronization process. This section describes the process for preparing the data in the GIS road centerlines and the MSAG data in order to compare the two data sets.

3.1.1 MSAG Standardization and Quality Control

The MSAG is a listing of all the road names and address ranges within a given area. Inconsistencies within the MSAG could translate into issues with the ALI data, how the call is routed, and could prevent a call from being properly located on the map.

A detailed comparison of the GIS street centerline data and the MSAG will identify many inconsistencies between the databases, including, but not limited to:

• Different road naming conventions
• Inaccurate address ranges
• Improper MSAG Community designations
• Improper Postal Community designations
• Improper Exchange designations
• Incorrect ESN assignments
• Incomplete or missing records
• Roads may be in the GIS that are not in the MSAG because the GIS roads do not have addressed structures associated with them.
Discrepancies between the GIS, the MSAG, and the ALI data can cause call routing and dispatching problems. Inaccuracies in the databases could lead to a delayed or improper response. By comparing GIS data to the MSAG, identifying the problems, creating discrepancy reports, and working to correct the discrepancies, these problems can be minimized.

Standardization is the process of agreeing on and utilizing a technical standard where uniform methods and criteria are used. This should be one of the first steps when comparing GIS and MSAG databases.

Standardization of the GIS road centerline data and the MSAG data should incorporate the following:

- N, S, E, W, NE, NW, SE, or SW are the only prefix and suffix directional abbreviations which are used, when a prefix and / or suffix directional is present.
- All punctuation should be avoided.
- Remove special characters (dash, underscore, apostrophe, quotes or any other special characters that could cause problems in any of the software or databases).
- Use only whole numbers in the house number fields (fractional house numbers belong in the House Number Suffix field).
- Use complete spelling of the legal street name assigned by the addressing authority (e.g. Saint Albans versus St Albans).
- Spell out the complete MSAG and Postal Community name.
- Prefix directional is only abbreviated when not part of the actual street name (North Dr would not be abbreviated to N Dr).
- Post directional abbreviated when they are not the actual street name. (Lone Pine Dr South would be abbreviated to Lone Pine Dr S, but Loop West Dr would not be abbreviated to Loop W Dr).
- Standardize street suffix according USPS Publication No. 28 – Appendix C1.

The Canadian Addressing Guide may be downloaded from the Canada Post / Postes Canada web site at URL:

English:  
http://www.canadapost.ca/business/offerings/address_management/can/addressing_guide-e.asp

French:  
http://www.postescanada.ca/business/offerings/address_management/can/addressing_guide-f.asp

**Figure 1. Example of Street Suffix Standardization**
**Note: Check with your USPS Addressing Information Management System (AMS) to determine how they show a street name, CR 45 or County Road 45 for example. The proper AMS office can be located by providing a city and state, or just a zip code, to the locator service at: [http://www.usps.com/ncsc/lookups/ams_office_locator.html](http://www.usps.com/ncsc/lookups/ams_office_locator.html).

Additionally, you can enter an address into the USPS Zip Code Lookup service at: [http://zip4.usps.com/zip4/welcome.jsp](http://zip4.usps.com/zip4/welcome.jsp), and the USPS address will be returned.

While the local addressing authority may not follow the accepted standardized road naming conventions given in this document, it is important to remember that standardization must take place on the 9-1-1 databases to ensure interoperability and to allow exchanging of GIS data with other regional, tribal, state, and federal agencies. Every effort should be made to educate the local addressing authorities that standardization will improve quality, lower cost, and improve the level of services to the public.
The street naming conventions should be consistent in the GIS street centerline, the MSAG and ALI data. This should be done not only for the synchronization process, but also for day-to-day operations and data sharing. All MSAG, ALI, and GIS road naming conventions must be consistent.

The standardization process should take place in both the MSAG and the GIS databases. Since the number of changes to the databases may be quite high, all involved parties must agree to the number of changes that can be processed in a timely manner and reviewing the contractual obligations of the involved providers is suggested.

To begin the process of standardization the following steps are recommended:

- Request the MSAG from your Data Base Management System provider.
- Load the MSAG into a worksheet or database format, with each field being in a separate column.
- Save the MSAG file (e.g. Initial MSAG).
- Save another copy of the MSAG under a different name (e.g. Copy of MSAG).
- Open the copy of the MSAG (e.g. Copy of MSAG).

The street naming conventions should be consistent in the GIS street centerline, the MSAG and ALI data. This should be done not only for the synchronization process, but also for day-to-day operations and data sharing. All MSAG, ALI, and GIS road naming conventions must be consistent.

The standardization process should take place in both the MSAG and the GIS databases. Since the number of changes to the databases may be quite high, all involved parties must agree to the number of changes that can be processed in a timely manner and reviewing the contractual obligations of the involved providers is suggested.

To begin the process of standardization the following steps are recommended:

- Request the MSAG from your Data Base Management System provider.
- Load the MSAG into a worksheet or database format, with each field being in a separate column.
- Save the MSAG file (e.g. Initial MSAG).
- Save another copy of the MSAG under a different name (e.g. Copy of MSAG).
- Open the copy of the MSAG (e.g. Copy of MSAG).
• Do not delete any records out of the original MSAG, only removing certain records from the “Copy of MSAG”.
• Sort the data by MSAG COMMUNITY and delete any FX Records in the “Copy of MSAG”.
  Make note of any records with a blank or incomplete MSAG COMMUNITY name as these will need to be resolved.
• If the MSAG contains Postal Community then sort by Postal Community and make note of any with missing or incomplete community names as these will need to be resolved.
• Sort the data by EXCHANGE and delete any wireless or VoIP records in the “Copy of MSAG”.
• Sort the data by LOW and HIGH address ranges and delete any records with blank, zero, or missing LOW and/or HIGH address ranges in the “Copy of MSAG”. Make note of the records with missing LOW and/or HIGH address ranges as these will need to be resolved.

If any of the MSAG records contains blank LOW and/or HIGH address ranges, MSAG or Postal Community Names, or ESN’s that are not in your area, these records need to be checked carefully and either sent back to the DBMS provider with corrected information or reconciled.

**Figure 3.** Example of missing MSAG Community names

<table>
<thead>
<tr>
<th>PD</th>
<th>STREET_NAME</th>
<th>SS</th>
<th>SD</th>
<th>LOW</th>
<th>HIGH</th>
<th>MSAG COMMUNITY</th>
<th>O/E</th>
<th>ESN</th>
<th>EXCH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPLEFORD</td>
<td></td>
<td>1100</td>
<td>1199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>00093</td>
<td>ANK</td>
</tr>
<tr>
<td>BARONRIDGE DR</td>
<td></td>
<td>1000</td>
<td>1099</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>00093</td>
<td>4422</td>
</tr>
<tr>
<td>BLUEBONNET</td>
<td></td>
<td>1200</td>
<td>1499</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>00093</td>
<td>ANK</td>
</tr>
</tbody>
</table>

MSAG records entered to allow validation of FX, wireless or VoIP records not in the GIS should be deleted from the “Copy of MSAG”. MSAG records that do not have a MSAG Community Name and / or a Postal Community name (if present in the MSAG), should be corrected to include the proper Community names completely spelled out. Figure 4 illustrates some of these types of MSAG records that need to be removed from the Copy of MSAG prior to comparing this information against the GIS street centerline data.

**Figure 4.** MSAG records to be removed from the “Copy of MSAG”

<table>
<thead>
<tr>
<th>PD</th>
<th>STREET_NAME</th>
<th>SS</th>
<th>SD</th>
<th>LOW</th>
<th>HIGH</th>
<th>MSAG COMMUNITY</th>
<th>O/E</th>
<th>ESN</th>
<th>EXCH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOREIGN EXCHANGE</td>
<td>ST</td>
<td>1</td>
<td>1</td>
<td>TAYLOR</td>
<td></td>
<td></td>
<td></td>
<td>00093</td>
<td></td>
</tr>
<tr>
<td>FX - KIRBY</td>
<td>RD</td>
<td>500</td>
<td>500</td>
<td>TAYLOR</td>
<td>E</td>
<td>00093</td>
<td>5442</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX -IFTWOOD</td>
<td>DR</td>
<td>207</td>
<td>207</td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>5442</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX - PINE</td>
<td>CIR</td>
<td>1111</td>
<td>1111</td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>5442</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX - WILLOW HILL</td>
<td>DR</td>
<td>4102</td>
<td>4102</td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>HO1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX - WILLOW HILL</td>
<td>DR</td>
<td>4102</td>
<td>4102</td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>ANK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANNAPOLIS</td>
<td>DR</td>
<td>2</td>
<td>2</td>
<td>SEABROOK</td>
<td></td>
<td></td>
<td>00093</td>
<td>ANK</td>
<td></td>
</tr>
<tr>
<td>WIRELESS</td>
<td></td>
<td></td>
<td></td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>WRLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1718 KIRBY BLVD - SW</td>
<td></td>
<td></td>
<td></td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>WRLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1718 KIRBY BLVD - N</td>
<td></td>
<td></td>
<td></td>
<td>TAYLOR</td>
<td></td>
<td>00093</td>
<td>WRLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOBILE WAY</td>
<td></td>
<td>2</td>
<td>2</td>
<td>LAKEVIEW</td>
<td></td>
<td></td>
<td>00093</td>
<td>WRLS</td>
<td></td>
</tr>
</tbody>
</table>
It is strongly recommended that the information in the Copy of MSAG be sent to the addressing entities for their review. The entities may have streets not shown on the MSAG or may have either renamed or extended a street and failed to forward proper notification or documentation.

**Correcting the Initial MSAG Records**

- Any changes that need to be made will have to be sent to the proper agencies to be corrected.
- Make note of any MSAG errors, but do not change anything in this MSAG copy (Copy of MSAG).
- Make a copy of the “Copy of MSAG” and name it “MSAG Changes”.
- Open the “MSAG Changes” and add columns for New Prefix Direction, New Street Name, New Street Suffix, and New Street Suffix Direction, or other fields needing correction, similar to the example below. These fields will store the information that needs to be changed in the MSAG.
- Review each MSAG record for Prefix Directional, Street Name, Street Type, Post-Directional, and Community Name standardization.
- Review to make sure the proper information is in the correct field.

Again, in the First Pass we are only changing street names and ESN’s. A very similar process will be used when we compare the MSAG and GIS data for MSAG Community, Postal Community, and Low and High address ranges later.

Note: Corrections to the MSAG data in your DBMS may differ from this process.

**Figure 5. Example of Changes to MSAG table (not all fields are shown)**

<table>
<thead>
<tr>
<th>PD</th>
<th>STREET_NAME</th>
<th>ST_SUF</th>
<th>SD</th>
<th>LOW</th>
<th>HIGH</th>
<th>COMMUNITY</th>
<th>ESN</th>
<th>N_PD</th>
<th>N_STREET_NAME</th>
<th>N_ST_SUF</th>
<th>N_SD</th>
<th>N_ESN</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLEFORD</td>
<td>DR</td>
<td>1100</td>
<td>1199</td>
<td>TAYLOR</td>
<td>093</td>
<td>APPLEFORD</td>
<td>DR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BARONRIDGE</td>
<td>DR</td>
<td>1000</td>
<td>1099</td>
<td>TAYLOR</td>
<td>093</td>
<td>BARONRIDGE</td>
<td>WAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHADBURY</td>
<td>DR</td>
<td>800</td>
<td>899</td>
<td>TAYLOR</td>
<td>093</td>
<td>CHADBURY</td>
<td>RD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORAL WAY</td>
<td>DR</td>
<td>1300</td>
<td>1322</td>
<td>TAYLOR</td>
<td>093</td>
<td>CORAL WAY</td>
<td>DR</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORAL WAY</td>
<td>CT</td>
<td>1500</td>
<td>1511</td>
<td>TAYLOR</td>
<td>093</td>
<td>CORAL WAY</td>
<td>DR</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRAIGMORE</td>
<td>DR</td>
<td>1000</td>
<td>1199</td>
<td>TAYLOR</td>
<td>093</td>
<td>CRAIGMORE</td>
<td></td>
<td>112</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CROWNWOOD</td>
<td>DR</td>
<td>4100</td>
<td>4299</td>
<td>TAYLOR</td>
<td>093</td>
<td>CROWNWOOD</td>
<td>LN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DARTMOUTH</td>
<td>DR</td>
<td>100</td>
<td>199</td>
<td>SEABROOK</td>
<td>093</td>
<td>DARTMOUTH</td>
<td></td>
<td>112</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELANEY</td>
<td>DR</td>
<td>900</td>
<td>999</td>
<td>TAYLOR</td>
<td>093</td>
<td>DELANEY</td>
<td>LN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The 9-1-1 Authority should provide corrected and standardized information back to the respective agency for updating. The “MSAG Changes” document will be used to track and send changes to the DBMS provider for updates and will contain corrections to the discrepancies for this process. Submission of changes must be completed using agreed upon formats or interfaces.

**3.1.2 GIS Data Standardization and Quality Control**

Most of the information in this section for GIS centerline data is covered in NENA GIS Data Collection and Maintenance Standards NENA 02-014, Issue 1, July 17, 2007. This document should be referred to for recommended audits, quality control, quality assurance, and related information. Parts of that document have been expanded on for the focus of this discussion.
The representation of a roadway in a GIS system is often referred to as a street centerline or an addresses centerline, which represents the center of the road, not the right-of-way or the edge of the property line. The attribute fields within the centerline data include high and low address ranges along each segment of the road. The high and low addresses are further broken down into left and right side address, so each centerline segment will have a left-side low address, a right-side low address, a left-side high address and a right-side high address. Actual address ranges should be used.

**Figure 6. GIS Data Model Version 2 – Street Centerlines**

<table>
<thead>
<tr>
<th>ATTRIBUTE NAME</th>
<th>USE R/O</th>
<th>TYPE</th>
<th>DATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Address Left</td>
<td>R</td>
<td>N</td>
<td>Lowest address on left side of street in ascending order</td>
</tr>
<tr>
<td>High Address Left</td>
<td>R</td>
<td>N</td>
<td>Highest address on left side of street in ascending order</td>
</tr>
<tr>
<td>Low Address Right</td>
<td>R</td>
<td>N</td>
<td>Lowest address on right side of street in ascending order</td>
</tr>
<tr>
<td>High Address Right</td>
<td>R</td>
<td>N</td>
<td>Highest address on right side of street in ascending order</td>
</tr>
<tr>
<td>Prefix Directional</td>
<td>R</td>
<td>A</td>
<td>Leading street direction prefix. Valid Entries: N S E W NE NW SE SW</td>
</tr>
<tr>
<td>Street Name</td>
<td>R</td>
<td>A</td>
<td>Valid street name as assigned by local addressing authority</td>
</tr>
<tr>
<td>Street Suffix</td>
<td>R</td>
<td>A</td>
<td>Valid Street abbreviation, as defined by the US Postal Service Publication 28. (e.g. AVE)</td>
</tr>
<tr>
<td>Post Directional</td>
<td>R</td>
<td>A</td>
<td>Trailing street direction suffix. Valid Entries: N S E W NE NW SE SW</td>
</tr>
<tr>
<td>Road Class</td>
<td>R</td>
<td>A</td>
<td><a href="http://www.fhwa.dot.gov/planning/fctoc.htm">http://www.fhwa.dot.gov/planning/fctoc.htm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Highway Performance Monitoring System (HPMS) Functional Classifications:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Interstate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2= Other Freeways and Expressways</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3= Other Principal Arterial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4= Minor Arterial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5= Major Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6= Minor Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7= Local</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not designated as a HPMS Functional Classification, but none the less an important road classification for 9-1-1:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8= Trails (Recreational trails)</td>
</tr>
<tr>
<td>One-way</td>
<td>R</td>
<td>A</td>
<td>One way road classification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B or Blank – travel in both directions allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FT – One-way from FROM node to TO node (in direction of arc)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TF – One way from TO node to FROM Node</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(The one-way fields may be different depending on the software used)</td>
</tr>
<tr>
<td>Postal Community Name Left</td>
<td>R</td>
<td>A</td>
<td>Postal Community Name as identified on the left side of the street</td>
</tr>
<tr>
<td>Postal Community Name Right</td>
<td>R</td>
<td>A</td>
<td>Postal Community Name as identified on the right side of the street</td>
</tr>
<tr>
<td>Postal Code/Zip Code Left</td>
<td>R</td>
<td>AN</td>
<td>Postal or Zip code as identified on the Left side of the street. Format: ANANAN or NNNNN</td>
</tr>
<tr>
<td>Postal Code/Zip Code Right</td>
<td>R</td>
<td>AN</td>
<td>Postal or Zip code as identified on the Right side of the street. Format: ANANAN or NNNNN</td>
</tr>
<tr>
<td>MSAG Community Name Left</td>
<td>R</td>
<td>A</td>
<td>Valid service community name as identified by the MSAG on the left side of the street</td>
</tr>
<tr>
<td>MSAG Community Name Right</td>
<td>R</td>
<td>A</td>
<td>Valid service community name as identified by the MSAG on the right side of the street</td>
</tr>
<tr>
<td>ESN Left</td>
<td>O</td>
<td>A</td>
<td>3-5 digit Emergency Service Number associated with street segment</td>
</tr>
<tr>
<td>ESN Right</td>
<td>O</td>
<td>A</td>
<td>3-5 digit Emergency Service Number associated with street segment</td>
</tr>
<tr>
<td>Segment ID</td>
<td>R</td>
<td>N</td>
<td>Unique Road Segment ID number</td>
</tr>
<tr>
<td>County Name Left</td>
<td>R</td>
<td>AN</td>
<td>County Name on the Left side of the street as given in FIPS 6-4</td>
</tr>
<tr>
<td>County Name Right</td>
<td>R</td>
<td>AN</td>
<td>County Name on the Right side of the street as given in FIPS 6-4</td>
</tr>
<tr>
<td>County Code Left</td>
<td>R</td>
<td>A</td>
<td>County Code on the Left side of the street as given in FIPS 6-4</td>
</tr>
<tr>
<td>County Code Right</td>
<td>R</td>
<td>A</td>
<td>County Code on the Right side of the street as given in FIPS 6-4</td>
</tr>
<tr>
<td>Source of Data</td>
<td>R</td>
<td>A</td>
<td>Agency that last updated the record</td>
</tr>
<tr>
<td>Date Updated</td>
<td>R</td>
<td>N</td>
<td>Date of last update Format: CCYY-MM-DD</td>
</tr>
</tbody>
</table>

Each street centerline segment should contain the low and high address values for the addresses assigned along that road centerline segment. In areas where there are no addresses assigned along a segment, a potential or probable range must be assigned.

If other applications using the GIS street centerline data require continuous addressing (e.g. 100 – 199 for one segment then 200-299 for the next with no “gaps” the in address ranges) it is strongly recommended that the NENA GIS Data Model fields for addressing be used to be reflect the actual address ranges of each street segment (e.g. 137 – 168 for one segment then 206 – 259 for the next segment) and another set of address fields be added to the GIS centerline data to accommodate any need for continuous address ranges. The use of actual address ranges is used to better reflect the address locations during geo-coding.

Some of the “Mapped ALI” and / or Computer Aided Dispatch (CAD) systems will only load street centerline data that is has continuous address ranges, that is, without any gaps in the address values in the attribute fields. The use of actual address range values or potential address range values is dependent on how other applications or entities will be using the street centerline data. Other systems may allow only continuous, potential, address ranges. Check with the vendors of the different systems to understand their limitations.
Below is an example of the GIS street centerline data carrying both the actual address ranges in the first four columns shown and the potential address ranges in the next four columns. This allows the data set to use the actual address ranges for better geocoding of the location of addresses and the flexibility to use the potential address ranges with other applications that require continuous addressing.

**Figure 7.** Using actual and potential address ranges in same GIS street centerline database

<table>
<thead>
<tr>
<th>Low Address Right</th>
<th>Low Address Left</th>
<th>High Address Right</th>
<th>High Address Left</th>
<th>LR_PA</th>
<th>LL_PA</th>
<th>HR_PA</th>
<th>HL_PA</th>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN Right</th>
<th>ESN Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>12512</td>
<td>12513</td>
<td>12586</td>
<td>12587</td>
<td>12500</td>
<td>12501</td>
<td>12598</td>
<td>12599</td>
<td>BAY AREA</td>
<td>BLVD</td>
<td></td>
<td>069</td>
<td>070</td>
<td></td>
</tr>
<tr>
<td>12622</td>
<td>12623</td>
<td>12670</td>
<td>12671</td>
<td>12600</td>
<td>12601</td>
<td>12698</td>
<td>12699</td>
<td>BAY AREA</td>
<td>BLVD</td>
<td></td>
<td>069</td>
<td>070</td>
<td></td>
</tr>
<tr>
<td>1802</td>
<td>1803</td>
<td>1872</td>
<td>1873</td>
<td>1899</td>
<td>1899</td>
<td>1899</td>
<td>1899</td>
<td>CALYPSO COVE</td>
<td>CT</td>
<td></td>
<td>079</td>
<td>079</td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>603</td>
<td>618</td>
<td>619</td>
<td>600</td>
<td>601</td>
<td>698</td>
<td>699</td>
<td>CORAL WAY</td>
<td>CT</td>
<td></td>
<td>093</td>
<td>093</td>
<td></td>
</tr>
<tr>
<td>408</td>
<td>409</td>
<td>427</td>
<td>428</td>
<td>400</td>
<td>401</td>
<td>498</td>
<td>499</td>
<td>CORAL WAY</td>
<td>DR</td>
<td></td>
<td>093</td>
<td>093</td>
<td></td>
</tr>
</tbody>
</table>

In Figure 8, 100 to 199 is the potential address range on the street segment, with the actual house location and addresses shown.

**Figure 8.** Potential address ranges along street segment

In Figure 9, where potential addressing is being used, an address is geocoded to the street centerline in the GIS data as a point, which is placed along the street segment to approximate the location of the address. In the case of potential addressing the address locations of 101, 102, 111, 112, 121, and 122 would all be displayed near the beginning address of 100 as indicated by the stars in the diagram.
It is strongly recommended that actual addressing be used in the GIS street centerline. Using actual address ranges for the GIS street centerlines will improve the location accuracy of the geocoding process, and in Figure 9 the location of the geocoded point would be a closer approximation of the actual location of the structure. Close cooperation, coordination, and communication with the local addressing authority and the Postal Service will minimize the errors in the GIS street centerline data. The nuances of the local addressing system and available resources must be taken into consideration.

This document takes the approach that the GIS street centerline data should meet the following criteria:

- Is spatially accurate
- Attributes are accurate and complete and standardized (address ranges, ESN’s, Communities, spelling, abbreviations)
- Meets or exceeds all related NENA Standards
- Contains the necessary attributes to be used by multiple applications and users
- Maintained on a continual basis
- Contains all the valid addressing information present in the MSAG after corrections to both datasets and MSAG records are made
- Matches the corrected MSAG to a 98 percent or higher rate.

Some recommended quality checks for attributes in the GIS street centerline data set include:

- All street names are present in the street centerline attributes
- Street names conform to the legal names as assigned by the addressing authority. (Some addressing authorities do not follow standard practices for street naming, and the legal street name may conflict with standardized naming conventions, but the 9-1-1 databases must be standardized to ensure synchronization and conformance in the NG 9-1-1 environment, e.g. Northeast J. L. Higg Pky should be standardized to NE J L Higg Pkwy and all punctuations should be removed.
- Incorrect, incomplete, missing, or inconsistent road names are corrected.
• Street Prefixes and Suffixes are properly abbreviated when they exist, according to NENA Standards
• All MSAG Communities are populated with the correct information, are fully spelled out, and are consistent
• All Postal Communities are populated with the correct information, are fully spelled out, and are consistent
• Lower address ranges are lower than the high address ranges
• Left and Right addressing is consistently either odd or even addresses
• No attribute information missing such as ESZ, MSAG Community, etc…
• No overlapping address ranges exist
• All line segments should be flowing (oriented) in the direction of increasing address ranges
• Wireline ESN’s are all present and consistently coded in the GIS centerline data
• County ID’s exist (FIPS-Code: 5 digit - 2 numbers for state, 3 for county)
• PSAP-ID’s are all present


**Topology Elements**

A topologically correct street centerline allows the systems to verify addresses and assign those addresses to specific agencies, cities, ESZ areas, districts, beats, units, etc. It is also vital for defining intersections, common place names, vehicle routing, premise and hazard data. To maintain proper topology the addressed centerline data and related area boundary layers must adhere to the following minimum topology requirements:

• Each centerline segment must share an exact begin or end node with another centerline segment.
• If segments intersect without begin or end nodes, (i.e. overpasses or underpasses) a street intersection is not established.
• For routing purposes and intersection lookup purposes, each intersection must be split.
• Centerline segments must be split (broken) at all true (grade-level) intersections.
• Line (road) segments shall be split at intersections and ESZ boundaries. Road segments can be split at city and country boundaries as well.
• Consider splitting at railroad tracks and streams for intersection searches.
• The centerline segments should be drawn in the direction of increasing addresses, which is not necessarily the same as the direction of travel.

Note: The above processes, and more, are described in detail in NENA 02-014.

### 3.2 Synchronization Process Overview

MSAG and GIS data synchronization should take place in different phases. Phase One will compare the GIS street centerline data to the MSAG. Phase Two will reverse the comparison process by comparing the MSAG to the GIS street centerline data. The process of creating and comparing these
data sets is described in Section 2.2.1. An introduction to the concepts of this process is provided in this section.

**Phase One – GIS street centerline compared to MSAG**

In Phase One analysis, the MSAG data is the control dataset, and the GIS data is joined with the MSAG, to determine what records in the MSAG match the GIS street centerline data. The join process will also show what records in the MSAG are not in the GIS street centerline data. The join process requires a composite Unique Key in the MSAG and GIS data. The explanation and development process for the composite Unique Key are discussed in section 2.2.1.

An assumption cannot be made as to which discrepancies are correct or invalid. This process simply shows the discrepancies. A thorough investigation by local personnel will be required to determine if the MSAG, GIS, or both, require correction.

**Figure 10.** Example of GIS street centerline data ready to be joined (not all fields shown)

<table>
<thead>
<tr>
<th>Low Address</th>
<th>Low Address</th>
<th>High Address</th>
<th>High Address</th>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN</th>
<th>ESN</th>
<th>MSAG Community Right</th>
<th>MSAG Community Left</th>
<th>Unique Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>12512</td>
<td>12513</td>
<td>12586</td>
<td>12587</td>
<td></td>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>070</td>
<td>LA PORT</td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>12622</td>
<td>12623</td>
<td>12670</td>
<td>12671</td>
<td></td>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>070</td>
<td>LA PORT</td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>13522</td>
<td>13523</td>
<td>13536</td>
<td>13537</td>
<td></td>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>070</td>
<td>LA PORT</td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>1802</td>
<td>1803</td>
<td>1872</td>
<td>1873</td>
<td></td>
<td>CALYPSO COVE</td>
<td>CT</td>
<td>079</td>
<td></td>
<td></td>
<td>PASADENA</td>
<td>CALYPSO COVE CT 079</td>
<td></td>
</tr>
<tr>
<td>612</td>
<td>613</td>
<td>656</td>
<td>657</td>
<td></td>
<td>10TH ST</td>
<td>S</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>10TH ST S 080</td>
<td></td>
</tr>
<tr>
<td>408</td>
<td>409</td>
<td>514</td>
<td>515</td>
<td></td>
<td>12TH ST</td>
<td>S</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>12TH ST 080</td>
<td></td>
</tr>
<tr>
<td>4308</td>
<td>4309</td>
<td>2586</td>
<td>2587</td>
<td></td>
<td>ALBATROSS</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>ALBATROSS DR 080</td>
<td></td>
</tr>
<tr>
<td>1768</td>
<td>1769</td>
<td>1820</td>
<td>1821</td>
<td></td>
<td>BIMINI WAY</td>
<td></td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>BIMINI WAY 080</td>
<td></td>
</tr>
<tr>
<td>2422</td>
<td>2423</td>
<td>2278</td>
<td>2279</td>
<td></td>
<td>BLUE CANOE</td>
<td>CT</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>BLUE CANOE CT 080</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>501</td>
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<td>515</td>
<td></td>
<td>BLUE DOLPHIN</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>BLUE DOLPHIN DR 080</td>
<td></td>
</tr>
<tr>
<td>1776</td>
<td>1777</td>
<td>1966</td>
<td>1967</td>
<td></td>
<td>CAPRI</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>CAPRI LN 080</td>
<td></td>
</tr>
<tr>
<td>1740</td>
<td>1741</td>
<td>1846</td>
<td>1847</td>
<td></td>
<td>DOLOPHIN</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>DOLOPHIN DR 080</td>
<td></td>
</tr>
<tr>
<td>606</td>
<td>607</td>
<td>652</td>
<td>653</td>
<td>N</td>
<td>FLAMINGO</td>
<td></td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>N FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>4520</td>
<td>4521</td>
<td>4628</td>
<td>4629</td>
<td>S</td>
<td>FLAMINGO</td>
<td></td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>S FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>1012</td>
<td>1013</td>
<td>1236</td>
<td>1237</td>
<td>W</td>
<td>FLAMINGO</td>
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<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>W FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>1008</td>
<td>1009</td>
<td>1086</td>
<td>1087</td>
<td>N</td>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>N HERON DR 080</td>
<td></td>
</tr>
<tr>
<td>1151</td>
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<td>1266</td>
<td>1267</td>
<td>N</td>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>N HERON DR 080</td>
<td></td>
</tr>
<tr>
<td>1332</td>
<td>1333</td>
<td>1460</td>
<td>1461</td>
<td>S</td>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>S HERON DR 080</td>
<td></td>
</tr>
<tr>
<td>4900</td>
<td>4901</td>
<td>4998</td>
<td>4999</td>
<td>S</td>
<td>SURF OAKS</td>
<td></td>
<td>080</td>
<td>080</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>S SURF OAKS 080</td>
<td></td>
</tr>
<tr>
<td>1502</td>
<td>1503</td>
<td>1518</td>
<td>1519</td>
<td>CORAL WAY</td>
<td>CT</td>
<td></td>
<td>093</td>
<td>093</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>CORAL WAY CT 093</td>
<td></td>
</tr>
<tr>
<td>1306</td>
<td>1307</td>
<td>1322</td>
<td>1323</td>
<td>CORAL WAY</td>
<td>DR</td>
<td></td>
<td>093</td>
<td>093</td>
<td>SEABROOK</td>
<td>SEABROOK</td>
<td>CORAL WAY DR 093</td>
<td></td>
</tr>
</tbody>
</table>
In Figure 12, note that Bay Area Blvd in ESN 070 is in the MSAG but did not join to the GIS street centerline data because the Unique Key in the GIS data was built using ESN Right (069). When the left and right ESN’s differ, care must be taken to ensure the MSAG and GIS data are correct. In this case the GIS Street centerline data does contain Bay Area Blvd with the left and right ESN’s being correctly attributed.

In the MSAG Capri Dr in ESN 080 did not join to any records in the GIS street centerline data. In the GIS data the street is Capri Ln in ESN 080. Since the street suffixes differ, the join process did not match the records.
The process of finding and correcting these discrepancies is described in Section 2.2.1.

### Phase Two – MSAG compared to GIS street centerline

In the Phase Two analysis the GIS street centerline data is the control and the MSAG is joined with the GIS data to determine what records in the GIS data match the MSAG. The join process will also show records that exist in the GIS data that are not in the MSAG. The join process in Phase Two also requires a composite Unique Key as discussed in Section 2.2.1.

As stated above, investigation by local personnel is needed to determine if the GIS data, MSAG, or both require correction. For example, if there is a street with address ranges in the map that is not in the MSAG, then local personnel will need to determine if the GIS street centerline data is accurate, and whether or not the street officially does exist. If it is determined that the street actually exists, then the MSAG should be edited to accommodate the street name and address ranges.

Comparing the GIS data to the MSAG data will show the discrepancies between the MSAG and the GIS street centerline data, such as the street names or ESN’s in the MSAG that do not match those in the GIS street centerline data.

#### Figure 13. Example of MSAG table joined to the GIS data

<table>
<thead>
<tr>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN Right</th>
<th>ESN Left</th>
<th>Unique Key</th>
<th>PS</th>
<th>ST_NAME</th>
<th>TYPE</th>
<th>SD</th>
<th>LOW</th>
<th>HIGH</th>
<th>MSG_COMM</th>
<th>O/E</th>
<th>ESN</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>070</td>
<td>BAY AREA BLVD 069</td>
<td>BAY AREA BLVD 069</td>
<td>12500</td>
<td>13598</td>
<td>LA PORTE E 069</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CALYPSO COVE</td>
<td>CT</td>
<td>079</td>
<td>079</td>
<td>CALYPSO COVE CT 079</td>
<td>CALYPSO COVE CT 079</td>
<td>1800</td>
<td>1899</td>
<td>PASADENA B 079</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10TH</td>
<td>ST S</td>
<td>080</td>
<td>080</td>
<td>10TH ST S 080</td>
<td>10TH ST S 080</td>
<td>12TH ST 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12TH</td>
<td>ST</td>
<td>080</td>
<td>080</td>
<td>12TH ST 080</td>
<td>12TH ST 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ALBATROSS</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>ALBATROSS DR 080</td>
<td>ALBATROSS DR 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIMINI</td>
<td>WAY</td>
<td>080</td>
<td>080</td>
<td>BIMINI WAY 080</td>
<td>BIMINI WAY 080</td>
<td>1700</td>
<td>1899</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLUE CANOE</td>
<td>CT</td>
<td>080</td>
<td>080</td>
<td>BLUE CANOE CT 080</td>
<td>BLUE CANOE CT 080</td>
<td>2400</td>
<td>2499</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLUE DOLPHIN</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>BLUE DOLPHIN DR 080</td>
<td>BLUE DOLPHIN DR 080</td>
<td>5000</td>
<td>5000</td>
<td>SEABROOK E 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPRI</td>
<td>LN</td>
<td>080</td>
<td>080</td>
<td>CAPRI LN 080</td>
<td>CAPRI LN 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOLPHIN</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>DOLPHIN DR 080</td>
<td>DOLPHIN DR 080</td>
<td>1700</td>
<td>1899</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAMINGO</td>
<td></td>
<td>080</td>
<td>080</td>
<td>N FLAMINGO 080</td>
<td>N FLAMINGO 080</td>
<td>600</td>
<td>699</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAMINGO</td>
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<td>080</td>
<td>080</td>
<td>S FLAMINGO 080</td>
<td>S FLAMINGO 080</td>
<td>4500</td>
<td>4699</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>N HERON DR 080</td>
<td>N HERON DR 080</td>
<td>1000</td>
<td>1299</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>N HERON DR 080</td>
<td>N HERON DR 080</td>
<td>1000</td>
<td>1299</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HERON</td>
<td>DR</td>
<td>080</td>
<td>080</td>
<td>S HERON DR 080</td>
<td>S HERON DR 080</td>
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<td>1499</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURF OAKS</td>
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<td>080</td>
<td>080</td>
<td>SURF OAKS 080</td>
<td>SURF OAKS 080</td>
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<td>4999</td>
<td>SEABROOK B 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORAL WAY</td>
<td>CT</td>
<td>093</td>
<td>093</td>
<td>CORAL WAY CT 093</td>
<td>CORAL WAY CT 093</td>
<td>1500</td>
<td>1511</td>
<td>TAYLOR B 093</td>
<td></td>
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<td>DR</td>
<td>093</td>
<td>093</td>
<td>CORAL WAY DR 093</td>
<td>CORAL WAY DR 093</td>
<td>1300</td>
<td>1322</td>
<td>TAYLOR B 093</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the MSAG data is joined to the GIS street centerline data the streets in the MSAG data that are not in the GIS data, and those that are not an exact match, can be easily identified. In Figure 13 the GIS data contains a 10th St S, a 12th St, an Albatross Dr, and the previously discussed Capri Ln.
which are not in the MSAG data. The process of finding and correcting these discrepancies is described in Section 2.2.1 below.

### 3.2.1 Synchronization of GIS Street Centerline data to the MSAG

In order to synchronize the two data sets the first step is to do a comparison of the data. A common database technique found in all of today’s GIS software packages and relational database management systems called a “join” will be used to compare the GIS street centerline data to the MSAG. A join combines records from two tables into a new table. The following examples use a special type of join, often referred to as an “inner join” or a “table join”, which requires each record in the two tables to have a matching record in order for the join to occur. The matching record in this case is on a unique composite key of several of the attributes in each of the two tables.

Joining the MSAG records to the GIS street centerline data creates a database containing all the records in the GIS street centerline data and the records in the MSAG data that are an exact match of the unique key found in the GIS data as shown in Figure 13. Figures 14 and 15 combine the Prefix Directional, Street Name, Street Suffix, Post Directional and the ESN of each record for both the MSAG and GIS data to create the unique composite key, or the unique key.

Conversely, if the GIS street centerline data was joined to the MSAG data, the resulting database would contain all of the records in the MSAG data and those records in the GIS data that were an exact match of the unique key found in the MSAG data as shown in Figure 12. These types of joins are known as a full outer join.

The use of the ESN in conjunction with the other attributes of the complete street name yields the most discrepancies. Other unique composite keys will be created by using the MSAG or Postal Community, in both the GIS and MSAG tables, in place of the ESN number used in these examples to further refine the synchronization process. Using the MSAG Community name and the Postal Community Name in place of the ESN will be discussed at the end of this section.

**Figure 14.** Unique Key field added to the MSAG Data (not all fields shown)

<table>
<thead>
<tr>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN</th>
<th>E/O</th>
<th>Unique Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelly</td>
<td>Ct</td>
<td>S</td>
<td></td>
<td>111</td>
<td>B</td>
<td>Kelly Ct S 111</td>
</tr>
<tr>
<td>Kelly</td>
<td>Ct</td>
<td>S</td>
<td></td>
<td>115</td>
<td>O</td>
<td>Kelly Ct S 115</td>
</tr>
<tr>
<td>S</td>
<td>Main</td>
<td>S</td>
<td></td>
<td>220</td>
<td>O</td>
<td>S Main 220</td>
</tr>
<tr>
<td>S</td>
<td>Main</td>
<td>E</td>
<td></td>
<td>226</td>
<td></td>
<td>S Main 226</td>
</tr>
<tr>
<td>S</td>
<td>Main</td>
<td>O</td>
<td></td>
<td>221</td>
<td></td>
<td>S Main 221</td>
</tr>
</tbody>
</table>
**Figure 15.** Unique Key added to the GIS Street Centerline Data (not all fields shown)

<table>
<thead>
<tr>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN_L</th>
<th>Unique Key</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kelly</td>
<td>Ct</td>
<td>S</td>
<td>111</td>
<td>Kelly Ct S 111</td>
</tr>
<tr>
<td>S</td>
<td>Main</td>
<td></td>
<td></td>
<td>220</td>
<td>S Main 220</td>
</tr>
<tr>
<td>S</td>
<td>Main</td>
<td></td>
<td></td>
<td>221</td>
<td>S Main 221</td>
</tr>
<tr>
<td>W</td>
<td>Adams</td>
<td>Ave</td>
<td></td>
<td>111</td>
<td>W Adams Ave 111</td>
</tr>
</tbody>
</table>

Notes on Joining the MSAG and GIS street centerline data:

- The GIS street centerlines contain a left and right ESN value. Care should be taken when the left and right ESN values differ as these may be streets that form the border of the ESN’s, Postal Communities and/or MSAG Communities.
- These streets can be identified in the MSAG data by having an Even (E) or Odd (O) parity value in the E/O column of the MSAG. If the streets are completely within an ESN in the MSAG data then this column should contain a B for Both, assuming the MSAG data is correct.
- MSAG records that contain an Even (E) or an Odd (O) only range also require special consideration as they may form the boundary between two or more ESN’s. These types of records should be carefully checked against the Left and Right ESN values in the GIS street centerline data.
- The GIS street centerline data and the MSAG data may store the ESN values differently. However, they must be the same length for the join process to work correctly. For example, the street name of SMITH ST with an ESN value of 00021 in the MSAG data, and a street name of SMITH ST with an ESN value of 021 in the GIS street centerline data will not allow the join process, since SMITH ST 00021 is not the same as SMITH ST 021.
- Many typical computer software applications for spreadsheets or databases allow the unique composite key in the MSAG to be created using the “concatenate” command, or similar function.
- It is recommended that both GIS and MSAG unique key fields be converted to uppercase in order for the Join process to work correctly, for example “Smith St” may not match “SMITH ST”.
- All extra spaces need to be removed from the unique key, e.g. replacing two spaces with one space and removing leading and trailing spaces. In Figure 16 below there is an extra space before “Kelly” in the first Unique Key record and in the second Unique Key is an extra space between “Main” and “220”. These must be removed prior to joining the two data sets for the join to work properly.
Figure 16. Unique Key having extra spaces

<table>
<thead>
<tr>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN_L</th>
<th>Unique Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>KELLY</td>
<td>CT</td>
<td>S</td>
<td>111</td>
<td>_KELLY_CT_S_111</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>MAIN</td>
<td></td>
<td>220</td>
<td>S_MAIN_220</td>
</tr>
</tbody>
</table>

All leading and trailing spaces must be removed from both the GIS street centerline data and the MSAG data unique key. When joining the MSAG and the GIS data together based on the unique key, the program may not recognize that “_Kelly” and “Kelly” are the same, since “_Kelly” has a space in front of the letter K. The same holds true for “S_Main__220” versus “S_Main_220”, where there are two spaces between Main and 220.

These types of issues are illustrated in Figure 17, the “Centerline Unique Key Uncorrected, and figure 18, “Centerline Unique Key Corrected”. Notice the leading, double, and trailing spaces in Figure 17, and the correction in Figure 18

Figure 17. Centerline Unique Key Uncorrected (not all fields shown)
### Figure 18. Centerline Unique Key Corrected (not all fields shown)

<table>
<thead>
<tr>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN Right</th>
<th>ESN Left</th>
<th>MSAG Community Right</th>
<th>MSAG Community Left</th>
<th>Unique Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>LA PORT</td>
<td>070</td>
<td></td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>LA PORT</td>
<td>070</td>
<td></td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>LA PORT</td>
<td>070</td>
<td></td>
<td>PASADENA</td>
<td>BAY AREA BLVD 069</td>
<td></td>
</tr>
<tr>
<td>CALYPSO COVE</td>
<td>CT</td>
<td>079</td>
<td>PASADENA</td>
<td>079</td>
<td></td>
<td>CALYPSO COVE CT 079</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10TH</td>
<td>ST</td>
<td>S</td>
<td>080</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>10TH ST S 080</td>
<td></td>
</tr>
<tr>
<td>12TH</td>
<td>ST</td>
<td>S</td>
<td>080</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>12TH ST 080</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>FLAMINGO</td>
<td>080</td>
<td>SEABROOK</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>N FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>FLAMINGO</td>
<td>080</td>
<td>SEABROOK</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>S FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>FLAMINGO</td>
<td>080</td>
<td>SEABROOK</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>W FLAMINGO 080</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>HERON DR</td>
<td>080</td>
<td>SEABROOK</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>N HERON DR 080</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>SURF OAKS</td>
<td>080</td>
<td>SEABROOK</td>
<td>080</td>
<td></td>
<td>SEABROOK</td>
<td>S SURF OAKS 080</td>
<td></td>
</tr>
<tr>
<td>CORAL WAY</td>
<td>CT</td>
<td>093</td>
<td>SEABROOK</td>
<td>093</td>
<td></td>
<td>SEABROOK</td>
<td>CORAL WAY CT 093</td>
<td></td>
</tr>
<tr>
<td>CORAL WAY</td>
<td>DR</td>
<td>093</td>
<td>SEABROOK</td>
<td>093</td>
<td></td>
<td>SEABROOK</td>
<td>CORAL WAY DR 093</td>
<td></td>
</tr>
</tbody>
</table>

### Figure 19. GIS Street Centerline Joined to MSAG data

<table>
<thead>
<tr>
<th>MSAG.Unique_Key</th>
<th>Prefix Directional</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>Post Directional</th>
<th>ESN Right</th>
<th>ESN Left</th>
<th>Centerline Unique_Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAY AREA BLVD 069</td>
<td>BAY AREA</td>
<td>BLVD</td>
<td>069</td>
<td>LA PORT</td>
<td>070</td>
<td></td>
<td>BAY AREA BLVD 069</td>
</tr>
<tr>
<td>BAY AREA BLVD 070</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CALYPSO COVE CT 079</td>
<td>CALYPSO COVE</td>
<td>CT</td>
<td>079</td>
<td></td>
<td>079</td>
<td></td>
<td>CALYPSO COVE CT 079</td>
</tr>
<tr>
<td>BIMINI WAY 080</td>
<td>BIMINI</td>
<td>WAY</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>BIMINI WAY 080</td>
</tr>
<tr>
<td>BLUE CANOE CT 080</td>
<td>BLUE CANOE</td>
<td>CT</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>BLUE CANOE CT 080</td>
</tr>
<tr>
<td>BLUE DOLPHIN DR 080</td>
<td>BLUE DOLPHIN</td>
<td>DR</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>BLUE DOLPHIN DR 080</td>
</tr>
<tr>
<td>CAPRI DR 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOLPHIN DR 080</td>
<td>DOLPHIN</td>
<td>DR</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>DOLPHIN DR 080</td>
</tr>
<tr>
<td>N FLAMINGO 080</td>
<td>N</td>
<td>FLAMINGO</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>N FLAMINGO 080</td>
</tr>
<tr>
<td>S FLAMINGO 080</td>
<td>S</td>
<td>FLAMINGO</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>S FLAMINGO 080</td>
</tr>
<tr>
<td>W FLAMINGO 080</td>
<td>W</td>
<td>FLAMINGO</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>W FLAMINGO 080</td>
</tr>
<tr>
<td>N HERON DR 080</td>
<td>N</td>
<td>HERON</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>N HERON DR 080</td>
</tr>
<tr>
<td>S HERON DR 080</td>
<td>S</td>
<td>HERON</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>S HERON DR 080</td>
</tr>
<tr>
<td>S SURF OAKS 080</td>
<td>S</td>
<td>SURF OAKS</td>
<td>080</td>
<td></td>
<td>080</td>
<td></td>
<td>S SURF OAKS 080</td>
</tr>
<tr>
<td>CORAL WAY CT 093</td>
<td>CORAL WAY</td>
<td>CT</td>
<td>093</td>
<td></td>
<td>093</td>
<td></td>
<td>CORAL WAY CT 093</td>
</tr>
<tr>
<td>CORAL WAY DR 093</td>
<td>CORAL WAY</td>
<td>DR</td>
<td>093</td>
<td></td>
<td>093</td>
<td></td>
<td>CORAL WAY DR 093</td>
</tr>
</tbody>
</table>
Figure 20. MSAG Joined to GIS Street Centerline

<table>
<thead>
<tr>
<th>Centerline Unique_Key</th>
<th>PS</th>
<th>ST_NAME</th>
<th>TYPE</th>
<th>SD</th>
<th>LOW</th>
<th>HIGH</th>
<th>MSAG COMMUNITY</th>
<th>O/E</th>
<th>ESN</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAY AREA BLVD 069</td>
<td>BAY</td>
<td>AREA</td>
<td>BLVD</td>
<td>1250</td>
<td>13598</td>
<td></td>
<td>LA PORTE</td>
<td>E</td>
<td>069</td>
</tr>
<tr>
<td>CALYPSO COVE CT 079</td>
<td>CALYPSO</td>
<td>COVE</td>
<td>CT</td>
<td>1800</td>
<td>1899</td>
<td></td>
<td>PASADENA</td>
<td>B</td>
<td>079</td>
</tr>
<tr>
<td>10TH ST S 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12TH ST 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALBATROSS DR 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIMINI WAY 080</td>
<td>BIMINI</td>
<td>WAY</td>
<td></td>
<td>1700</td>
<td>1899</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>BLUE CANOE CT 080</td>
<td>BLUE</td>
<td>CANOE</td>
<td>CT</td>
<td>2400</td>
<td>2499</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>BLUE DOLPHIN DR 080</td>
<td>BLUE</td>
<td>DOLPHIN</td>
<td>DR</td>
<td>500</td>
<td>500</td>
<td></td>
<td>SEABROOK</td>
<td>E</td>
<td>080</td>
</tr>
<tr>
<td>CAPRI LN 080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOLPHIN DR 080</td>
<td>DOLPHIN</td>
<td>DR</td>
<td></td>
<td>1700</td>
<td>1899</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>N FLAMINGO 080</td>
<td>N</td>
<td>FLAMINGO</td>
<td></td>
<td>600</td>
<td>699</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>S FLAMINGO 080</td>
<td>S</td>
<td>FLAMINGO</td>
<td></td>
<td>4500</td>
<td>4899</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>W FLAMINGO 080</td>
<td>W</td>
<td>FLAMINGO</td>
<td></td>
<td>1000</td>
<td>1299</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>N HERON DR 080</td>
<td>N</td>
<td>HERON</td>
<td>DR</td>
<td>1000</td>
<td>1299</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>N HERON DR 080</td>
<td>N</td>
<td>HERON</td>
<td>DR</td>
<td>1000</td>
<td>1299</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>S HERON DR 080</td>
<td>S</td>
<td>HERON</td>
<td>DR</td>
<td>1300</td>
<td>1499</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>S SURF OAKS 080</td>
<td>S</td>
<td>SURF OAKS</td>
<td></td>
<td>4900</td>
<td>4999</td>
<td></td>
<td>SEABROOK</td>
<td>B</td>
<td>080</td>
</tr>
<tr>
<td>CORAL WAY CT 093</td>
<td>CORAL</td>
<td>WAY</td>
<td>CT</td>
<td>1500</td>
<td>1511</td>
<td></td>
<td>TAYLOR</td>
<td>B</td>
<td>093</td>
</tr>
<tr>
<td>CORAL WAY DR 093</td>
<td>CORAL</td>
<td>WAY</td>
<td>DR</td>
<td>1300</td>
<td>1322</td>
<td></td>
<td>TAYLOR</td>
<td>B</td>
<td>093</td>
</tr>
</tbody>
</table>

The highlighted records in Figures 19 and 20 are the discrepancies between the MSAG and GIS data after both joins are performed. In Figure 19 the MSAG contains “Bay Area Blvd” in ESN 070 that is not in the joined street centerline data. There is also a discrepancy with the joined GIS data containing “Capri Dr” in ESN 080.

GIS street centerline data that contains different Left and Right side ESN’s also requires special attention. In cases where the left and right ESN’s differ in the GIS street centerline, the MSAG must be carefully consulted to ensure both datasets match.

In the case of “Bay Area Blvd” in Figure 19, the GIS data does contain a “Bay Area Blvd” that has a left side ESN of 069 and a right side ESN of 070, so the GIS data and MSAG data do agree with each other, but the ESN field used in creating the unique key only contained the ESN value of 069. The border streets and the records in the MSAG that have a different ESN on the odd side and even side require careful attention to determine if the GIS street centerline data and the MSAG data are in agreement.

Figure 19 shows “Capri Dr” in ESN 080, and Figure 20 shows “Capri Ln”. This discrepancy must be carefully researched to determine the reason it does not match in both data sets.

Note: Different software will show the records that do not join to the other table as either blank or as a NULL value.

Other join types are possible and may not include the unmatched records from either one or both original tables; care should be taken when dealing with different software vendors as the terminology of joins is not standardized.
Joining the GIS centerline data to the MSAG data, and then joining the MSAG data to the GIS centerline data will allow a determination to be made as to where the discrepancies exist. In the First Pass the ESN and street naming discrepancies will be identified.

Reasons why the two data sets do not properly join include, but are not limited to the following:

**Figure 21.** Common discrepancies found in the join process

<table>
<thead>
<tr>
<th>Problem</th>
<th>Parent Data</th>
<th>Joined Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Type missing</td>
<td>JONES RD</td>
<td>JONES</td>
</tr>
<tr>
<td>ESN's differ</td>
<td>00023</td>
<td>23</td>
</tr>
<tr>
<td>Street misspelled</td>
<td>JONES RD</td>
<td>JONEES RD</td>
</tr>
<tr>
<td>Post Directional transposed</td>
<td>JONES RD N</td>
<td>JONES RD N</td>
</tr>
<tr>
<td>Suffix Directional transposed</td>
<td>JONES RD N</td>
<td>JONES RD N</td>
</tr>
<tr>
<td>Community Names Differ</td>
<td>BURLINGTON</td>
<td>BURL</td>
</tr>
<tr>
<td>One Word vs. Two Word names</td>
<td>BLUEBONNET DR</td>
<td>BLUE BONNET DR</td>
</tr>
<tr>
<td>Incorrect Standardization</td>
<td>N LAKE DR</td>
<td>NORTH LAKE DR</td>
</tr>
</tbody>
</table>

Other Common Discrepancies:

- Street Names, Street Types, Pre and Post Direction
- Community Names with inconsistent spelling or with abbreviations in MSAG
- There will be streets segments in the GIS data that may not be in the MSAG such as unaddressed private roads, ramps, unaddressed connector streets, and proposed streets
- Improper ESN assignment

All MSAG records should be found in the GIS data, with the following exceptions: MSAG records for FX records, Test records, and VoIP and Wireless Shell records.

Synchronization between the MSAG and GIS must also apply to address ranges. The validation process for address ranges can be complex as the standard for applying ranges can vary between the MSAG and GIS data. As an example, the MSAG low to high ranges for a city street may be 100-399. The corresponding GIS street centerline data actual data ranges may be broken out by block ranges such as 110-159, 208-267, and 332-375. If the MSAG entry includes the low to high ranges for the corresponding street segments, the entry is considered validated.
Figure 22. Valid MSAG and GIS Street Centerline Ranges

<table>
<thead>
<tr>
<th>MSAG Data</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Name</td>
<td>Type</td>
<td>Low</td>
<td>High</td>
<td>ESN</td>
<td></td>
</tr>
<tr>
<td>SMITH</td>
<td>ST</td>
<td>100</td>
<td>399</td>
<td>00127</td>
<td></td>
</tr>
<tr>
<td>MAIN</td>
<td></td>
<td>1</td>
<td>199</td>
<td>00067</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GIS Street Centerline Data</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Name</td>
<td>Type</td>
<td>LF_ADD</td>
<td>RT_ADD</td>
<td>ESN</td>
<td></td>
</tr>
<tr>
<td>SMITH</td>
<td>ST</td>
<td>110</td>
<td>159</td>
<td>00127</td>
<td></td>
</tr>
<tr>
<td>SMITH</td>
<td>ST</td>
<td>208</td>
<td>267</td>
<td>00127</td>
<td></td>
</tr>
<tr>
<td>SMITH</td>
<td>ST</td>
<td>332</td>
<td>375</td>
<td>00127</td>
<td></td>
</tr>
</tbody>
</table>

Note: ALI databases must be verified to make sure that no addresses exist above the last address range of 375, shown in the GIS data. If there are ALI records, or other resources indicate addresses (permits, utility connections, tax records, etc. see NENA 02-013) above or below the address ranges in the GIS, then the GIS must be adjusted to accommodate these additional addresses.

Figure 23. Valid MSAG and GIS Street Centerline Address Ranges

<table>
<thead>
<tr>
<th>MSAG Data</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Name</td>
<td>Type</td>
<td>Low</td>
<td>High</td>
<td>ESN</td>
</tr>
<tr>
<td>MAIN</td>
<td></td>
<td>1</td>
<td>199</td>
<td>00067</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GIS Street Centerline Data</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Name</td>
<td>Type</td>
<td>LF_ADD</td>
<td>RT_ADD</td>
<td>ESN</td>
</tr>
<tr>
<td>MAIN</td>
<td>1</td>
<td>73</td>
<td>00067</td>
<td></td>
</tr>
<tr>
<td>MAIN</td>
<td>110</td>
<td>168</td>
<td>00067</td>
<td></td>
</tr>
<tr>
<td>MAIN</td>
<td>192</td>
<td>197</td>
<td>00067</td>
<td></td>
</tr>
</tbody>
</table>

There are two levels of address range synchronization: Street Level and Block Level. The following examples explain the difference between the two levels, or types.

Street Level Synchronization
The example in Figure 24 below shows street level synchronization. The MSAG entry includes the low to high address range for Main Street. The GIS street centerline data has address range gaps between the low and high addresses, and is acceptable for “Street Level Synchronization”.

This example does not qualify for block level synchronization because the MSAG entry includes addresses that are not in the GIS street centerline data.
Figure 24. Example of Street Level Synchronization

<table>
<thead>
<tr>
<th>MSAG Entry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN ST</td>
<td>100  333</td>
</tr>
</tbody>
</table>

GIS Street Centerline Ranges

<table>
<thead>
<tr>
<th>MSAG Entry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN ST</td>
<td>100  121</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>200  232</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>300  333</td>
</tr>
</tbody>
</table>

Block Level Synchronization

Block level synchronization has individual MSAG entries that account for the corresponding address ranges in the GIS street centerline data. This level of synchronization is possible when the GIS street centerline data contains actual address ranges, and you MSAG contain individual range entries.

Figure 25. Example of Block Level Synchronization

<table>
<thead>
<tr>
<th>MSAG Entry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN ST</td>
<td>100  121</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>200  232</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>300  333</td>
</tr>
</tbody>
</table>

GIS Street Centerline Data Ranges

<table>
<thead>
<tr>
<th>MSAG Entry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN ST</td>
<td>100  121</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>200  232</td>
</tr>
<tr>
<td>MAIN ST</td>
<td>300  333</td>
</tr>
</tbody>
</table>

Block level synchronization means the MSAG data and the GIS street centerline data are in complete agreement. However block level synchronization may not be achieved based on available resources and funding. Although Street Level Synchronization is acceptable there may still be discrepancies in the GIS street centerline data. If the resources are not available to have a Block Level Synchronization, then it is recommended that the ALI data be geocoded against the GIS street centerline data, which is discussed in Section 2.2.2.

Comparing the MSAG address ranges to the GIS Street Centerline can be accomplished by manual methods as described in this document, third party software, custom coding using tools available in the GIS software, Structure Query Language (SQL) statements, or generating reports based on the summary of the minimum and maximum address range of each unique street segment in each ESN which can be accomplished with most GIS software.
Postal Community Code Validation

The process of using ESN in the Unique Key field can be repeated using the Postal Community, in place of the ESN, to validate the Postal Community.

Figure 26. GIS Street Centerline Data with Postal Communities

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Street Name</th>
<th>Street Suffix</th>
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<td>SEABROOK</td>
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Figure 27. MSAG Data with Postal Communities

<table>
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</tr>
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<td>13599</td>
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<td>1899</td>
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<td>B</td>
<td>080</td>
<td>BIMINI WAY SEABROOK</td>
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<td>2499</td>
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</table>

MSAG Community Code validation

The above process of using ESN in the Unique Key field can be repeated using the MSAG Community, in place of the ESN, to validate the MSAG Community.
Figure 28. Example of GIS Street Centerline Data with MSAG Communities

<table>
<thead>
<tr>
<th>Prefix Directional</th>
<th>Street Name</th>
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<th>MSAG Community Right</th>
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</table>

Figure 29. MSAG Data with MSAG Communities

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<td>070</td>
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<tr>
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<td>SEABROOK</td>
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<td>080</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.2 ALI database to GIS Street Centerline Data

The ALI database can be geocoded against the GIS street centerline data (and address points where used), as another quality assurance measure. This can be used as a confirmation that all ALI information will be properly located in the GIS street centerline data. The ALI will not contain all address in an area; therefore, the ALI cannot be considered the sole source for addresses. Typically if the MSAG and GIS street centerline databases have been synchronized, then all ALI records should geocode correctly to the GIS street centerline data. Comparing the ALI database to GIS street centerline data will find any remaining discrepancies between the ALI and GIS street centerline data.

Comparing the ALI database to GIS street centerline data is not an easy task, but can be accomplished by geocoding the ALI database to the GIS street centerline data. Geocoding is the process of assigning a geographic coordinate location by comparing tabular address information to geographic reference information.
In this case the ALI database is the table of addresses and the GIS street centerline data is the geographic reference. Geocoded addresses can be created by mathematically calculating the address location using the GIS street centerline with address ranges as the reference. There are many GIS software packages that provide robust geocoding and interactive reporting tools. While the ALI database to GIS comparison is a test to ensure that there are no discrepancies between the MSAG, ALI, and GIS database, this process also simulates the behavior of how 9-1-1 calls from the ALI database will plot to the GIS data. This is a proactive way to identify any inconsistencies and enhance the accuracy of all associated 9-1-1 databases.

An example of a report that may be created from this type of comparison is shown in Figure 33.

The geocoding of the ALI data against the GIS street centerline data will require knowledge of the GIS geocoding process for the particular GIS software being used. Discrepancies between the ALI data and the GIS data will need to be resolved with close coordination and review between the GIS and MSAG personnel. Corrections may be required of the GIS street centerline data, the MSAG data or both. After correcting any discrepancies there needs to be close coordination with the DBMS, Service Provider, the Telco’s, and the Postal service to ensure there corrections are made to their data as well.

### 3.2.3 Site / Structure Location and ALI records Comparison

The objective is to insure that all ALI records and the attributes in the Site / Structure Location GIS data match and the information in the site / structure location layer are accurate as they should have been collected according to NENA 02-014 GIS Data Collection and Maintenance Standards. In order to do the comparison of the ALI records and the attributes in the Site / Structure Location Layer the following fields should be used:

**ALI Records**
- House Number
- House Number Suffix
- Prefix Directional
- Street Name
- Street Suffix
- Post Directional
- MSAG Community Name
- Postal Community Name
- ESN
- Zip Code
- Location

**Site / Structure Location Layer**
- House Number
- House Number Suffix
- Prefix Directional
Exclude Site / Structure Location data pertaining to Bridges, Billboards, Water Towers, and any other structures that would not be in the ALI database. Conversely the ALI records that should be excluded include VoIP and Wireless shell records, FX records, and Test Records.

A table of the required ALI data can be built with a Unique Key as shown below in Figure 30.

**Figure 30. Example of the ALI Table with the Unique Key**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<tr>
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<td>APPLE</td>
<td>LN</td>
<td>DERRY</td>
<td>456</td>
</tr>
<tr>
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<tr>
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<tr>
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<td>LOOP</td>
<td>RD</td>
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</tr>
</tbody>
</table>

The table of the GIS Site / Structure Locations will look similar to the one shown in Figure 31.

**Figure 31. Example of a GIS Site / Structure Location Table with the Unique Key**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>144</td>
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<tr>
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<td>MARKET</td>
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<td>BLVD</td>
<td>JACKSON CITY</td>
</tr>
<tr>
<td>41</td>
<td>MAIN</td>
<td>ST</td>
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<td>443</td>
</tr>
<tr>
<td>437</td>
<td>MAPLE</td>
<td>LN</td>
<td>BRADFORD</td>
<td>128</td>
</tr>
<tr>
<td>28</td>
<td>S</td>
<td>LOOP</td>
<td>RD</td>
<td>BRADFORD</td>
</tr>
<tr>
<td>221</td>
<td>CHESTNUT</td>
<td>ST</td>
<td>TAYLOR</td>
<td>340</td>
</tr>
<tr>
<td>84</td>
<td>MAIN</td>
<td>ST</td>
<td>TAYLOR</td>
<td>430</td>
</tr>
</tbody>
</table>
Joining the GIS Site / Structure Location data to the ALI data will show the records that do match exactly, based on the Unique Key, those records that do not match will be shown as empty in the joined GIS Site / Structure Location part of the table, as shown in Figure 32.

The GIS Site / Structure Locations that did not match the ALI table Unique Key are shown as blank and highlighted in yellow. The records that did not join together are the discrepancies.

The reason the join did not occur is listed in the last column of Figure 32 and is only shown to clarify; this column is added to the table only to illustrate the reasons for the records not joining.

This type of join will also show records in the ALI data that do not exist in the GIS data.

**Figure 32.** Joined ALI and GIS Site / Structure Locations

<table>
<thead>
<tr>
<th>MSAG Community</th>
<th>ESN</th>
<th>Zip Code</th>
<th>Location</th>
<th>Unique Key</th>
<th>Pre Dir.</th>
<th>Street Name</th>
<th>Street Suffix</th>
<th>MSAG Community</th>
<th>ESN</th>
<th>Zip Code</th>
<th>Location</th>
<th>Discrepancies</th>
</tr>
</thead>
<tbody>
<tr>
<td>DERRY</td>
<td>456</td>
<td>12345</td>
<td>BLDG A</td>
<td>123 APPLE LN W DERRY BLDG A 456 12345 W</td>
<td>APPLE</td>
<td>LN</td>
<td>DERRY</td>
<td>456</td>
<td>12345</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DERRY</td>
<td>456</td>
<td>12345</td>
<td>STE 208</td>
<td>144 APPLE LN DERRY STE 208 456 12345</td>
<td>APPLE</td>
<td>LN</td>
<td>DERRY</td>
<td>456</td>
<td>12345</td>
<td></td>
<td></td>
<td>Location Information not in GIS data</td>
</tr>
<tr>
<td>JACKSON CITY</td>
<td>444</td>
<td>54321</td>
<td>RM 222</td>
<td>333 E MARKET ST JACKSON CITY RM 222 444 54321</td>
<td>E Market St in ALI - Prefix Direction Differ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JACKSON CITY</td>
<td>444</td>
<td>54321</td>
<td></td>
<td>300 N VALLEY VIEW BLVD JACKSON CITY 444 54321</td>
<td>Valley View - 2 words in ALI, Valleyview in GIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JACKSON CITY</td>
<td>443</td>
<td>54321</td>
<td>UNIT 7</td>
<td>41 MAIN ST JACKSON CITY UNIT 7 443 54321</td>
<td>Location Information not in GIS data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRADFORD</td>
<td>128</td>
<td>33333</td>
<td></td>
<td>437 MAPLE LN BRADFORD 128 33333</td>
<td>MAPLE</td>
<td>LN</td>
<td>BRADFORD</td>
<td>128</td>
<td>33333</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRADFORD</td>
<td>128</td>
<td>33333</td>
<td></td>
<td>28 S LOOP RD BRADFORD 128 33333</td>
<td>S LOOP</td>
<td>RD</td>
<td>BRADFORD</td>
<td>128</td>
<td>33333</td>
<td></td>
<td></td>
<td>Zip Codes differ</td>
</tr>
<tr>
<td>TAYLOR</td>
<td>340</td>
<td>21212</td>
<td></td>
<td>228 CHESTNUT ST TAYLOR 340 21212</td>
<td>CHESTNUT</td>
<td>ST</td>
<td>TAYLOR</td>
<td>340</td>
<td>21212</td>
<td></td>
<td></td>
<td>ESN's differ</td>
</tr>
<tr>
<td>TAYLOR</td>
<td>340</td>
<td>21212</td>
<td></td>
<td>221 CHESTNUT ST TAYLOR 340 21212</td>
<td>CHESTNUT</td>
<td>ST</td>
<td>TAYLOR</td>
<td>340</td>
<td>21212</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Joining the ALI table to the GIS Site / Structure Locations will show the discrepancies as well as site / structure locations in the GIS data that are not in the ALI data.

Some software packages allows one to create custom reports that allow near continuous reporting of discrepancies as shown in Figure 33.
3.2.4 Discrepancy Correction

Coordinate with the Service Provider and the 9-1-1 DBMS provider on the required changes. The Service Provider must correct the ALI data, and / or the 9-1-1 DBMS provider must make the necessary changes after notification, without the use of translations.

Coordinate with the Service Provider and / or the DBMS provider for a timeline for the changes. In order to effectively transition into NENA i3 you must make sure your GIS and MSAG data discrepancies are resolved.

Note: This is a time consuming, labor intensive project that will require a significant commitment. It is not something that can be quickly completed. Although if desired, it can be sent out to a reputable vendor to have them process the discrepancies.
4 Conclusions
Some of the aspects to consider when developing Standard Operating Procedures (SOP’s) for synchronization include the following:

- Addressing Liaisons and Planning
- Addressing Review and Planning
- Road Naming Review
- Emergency Service Zone/Number Review
- USPS Coordination
- Master Street Address Guide
- Synchronization of all databases
- Documentation of EVERYTHING
- Creation of information about how the data was collected - Metadata
- Maintenance

It is important to be aware that the agency performing this process (presuming that it is not the addressing authority) CANNOT make the addressing authority change existing names. Part of this process is illustrating how to make the GIS data work with addressing inconsistencies, errors, and issues made in the past, and suggest that the corrections be made by the addressing authority.

5 References
Generally, the reference section of a document will be located at or near the end of the document, and will probably not be section 4 as it is in this Template. It will list all documents or other media used in development of this NENA OID. Some NENA OID’s will also include an Exhibits Section, which will come after the References Section, if applicable. Some NENA Operations Information Documents will also contain an Appendix Section, which would come last, if applicable.

- NENA Data Standards for Local Exchange Carriers, ALI Service Providers & 9-1-1 Jurisdictions, NENA 02-011, Version 7
- NENA Data Standards for the Provisioning and Maintenance of MSAG Files to VDBs and ERDBs, NENA 02-013, Version 3, June 7, 2008
- NENA GIS Data Collection and Maintenance Standards, NENA 02-014, Issue 1, July 17, 2007
• NENA Wireless (Pre-XML) Static and Dynamic ALI Data Content Technical Information Document --- DEF Format V 2.1, NENA 02-501, Issue 1, October 16, 2006

• NENA Wireless Phase I & II Features and Functions Operational Information Document, NENA 57-501 Final 01/20/04

• NENA Wireless Phase I/II Planning and Implementation Checklist and Modules OID, NENA 57-502, May 24, 2004

• A Public Safety Answering Point Managers’ Guide to Geographic Information Technology, a National Emergency Number Association White Paper, October 2002
## EXHIBIT E

| U.S. MAINTENANCE TERMS AND CONDITIONS FOR SOFTWARE |
INTEGRAPH CORPORATION, 7104 SOLUTION CENTER, CHICAGO, IL 60677

NIGP CODE 83845

Terms: \hspace{1cm} NET 30

Vendor Number: \hspace{1cm} 2011001635 0

Telephone Number: \hspace{1cm} 801-913-7822

Fax Number: \hspace{1cm} 256-730-8403

Contact Person: \hspace{1cm} MarkRoylance

E-mail Address: \hspace{1cm} mark.roylance@intergraph.com

Certificates of Insurance \hspace{1cm} Required

Contract Period: \hspace{1cm} To cover the period ending \textbf{February 28, 2017}